THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL XX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 559.

SEPTEMBER 11, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS.

SUMMARY:—
The Recent Earthquake and the effect it may have on Building Methods.—A Quick-moving Crane.—The Difficulty between New York Master-Plumbers and their Journeymen.—Can Lock-outs be prevented by Law?—Two Atrocious Cases of Boycotting.—A Curious Automatic-Sprinkler Accident.—Lamp-black Explosions and their Causes. 117
MUNTZ'S RAPHAEL.—I. 119
AN EDITOR'S TRIP ABROAD.—XII. 121
THE ILLUSTRATIONS:—
Upper Stories of Store, Boston, Mass.—Buildings designed by the late H. H. Richardson. 122
AMERICAN ARCHITECTURE FROM A FRENCH STANDPOINT. 122
THE DANGER ARISING FROM ELECTRIC-LIGHT WIRES AND THE UNDERGROUND SYSTEM. 124
SEWAGE DISPOSAL IN BERLIN. 126
AUTOMATIC SPRINKLERS, RATES AND CONTINGENCIES. 127
COMMUNICATIONS:—
The Moment of Inertia.—Rusty Drawing-Instruments.—The Leading American Architect.—The North Easton Town-hall. 127
NOTES AND CLIPPINGS. 128
TRADE SURVEYS. 128

NATURALLY the series of earthquakes which last week laid waste Charleston, S. C., and other places, has caused architects to reflect on how desirable it might be to consider seismic disturbances in completing work now in hand or in designing new work. As no country has yet discovered a style of building which is proof against earthquake shocks of every intensity, and as our social habits and our climate obviously prevent our following the methods most successfully employed in earthquake countries, it does not seem to us that architects need to reckon with a special factor-of-safety for earthquakes, at least not until experience has shown that subterranean disturbances are likely to find frequent relief by volcanic upheavals in this part of the globe. Except in the case of the tallest of modern buildings, any well-built structure that we are now in the habit of putting up would be likely to resist a shock as successfully as any building, equally adapted to every-day use and specially built, not with the idea of being absolutely earthquake-proof, but as affording a reasonable security for danger at a time of earth tremor. It seems to us that the matter is one to be regarded rather from the fatalist's point of view, who may be supposed to argue thus: "Earthquakes are always possible. It is hardly possible to build an earthquake-proof structure. I shall be just as dead if a one-story building falls on me as if I received my quietus from the fall of a ten-story one. I cannot have all the modern conveniences in a one-story building, and I cannot derive the income from it I can from a ten-story building. If I do not build a high building my neighbors will, and I might as well be killed by my own bricks-and-mortar as by theirs." Ordinary substantiality of building is all that, in most cases, the majority of architects and property-owners will think it necessary to undertake, and we think that the chances of such structures would have of resisting an earthquake-shock would be about as great as those of buildings specially designed and built to be earthquake-proof. Nevertheless, we believe that the disaster will certainly have an effect in curtailing the exorbitant height of future city buildings, and we are not such pessimists as not to feel hope that there will be on account of it a marked tendency to improve the construction of the average buildings everywhere.

THE most useful of the grosser building tools is unquestionably the crane, and the best of the American cranes are good enough for all ordinary kinds of work; but there are cases where the matter of time is an all-important factor, and any crane which economizes time in its evolutions should be introduced to the attention of all builders. *Le Génie Civil* gives an interesting account of quick-working cranes built on the system Borde, and particulars of the latest improvement on the original type as employed by M. Georges Averly, of Lyons, in building a viaduct at Dombief, which is well worth describing. In place of the usual mast, boom and guys familiar to all of us, M. Averly uses a framework very like the scaffolding of a pile-driver, and sixty-eight feet high. Pivoted at the top of this framework, and at the middle of its own length, extends, on either side, the arms of a bow-string lattice girder, seventy-four feet long, carefully balanced and moving like the walking-beam of a steamboat. The stationary engine on the platform below has two sets of hoisting-drums, from one of which runs the hoisting-rope, which passes over a fixed sheave at the head of the framework, and then along to a pulley at the end of, say, the right-hand arm of the tilting girder. The other drum winds up what we will call the halyard. This rope passes from the drum over a fixed sheave, which is fastened to the lower part of the frame, and is thence carried out to another fixed block at the end of the left-hand arm, and is then brought back and made fast to the frame at a point distant from the top of the frame somewhat less than the length of one arm of the girder. It is plain that when the engine winds-up the halyard the left-hand arm is depressed, and the right-hand arm is elevated, so that a load suspended from that arm is, without further ado, raised from the ground a distance equal to the height of the end of the right-hand arm above the axis of revolution. But, meanwhile, the hoisting-drum has been winding, in the hoisting-rope, and the result is, that when the right-hand end of the lever has reached its highest altitude, the load has practically reached the same point. That is, that while the end of the lever has risen through a distance of about thirty-five feet the load has in the same time risen through a distance of about one hundred and three feet. The enormous economy in time effected is apparent at a glance. The platform on which the whole apparatus is built revolves at need under the impulse of the engine, and as the whole thing stands on a track laid parallel to the face of the work, and over which it is moved also by the same engine, it is plain that the apparatus can reach every part of the work and accomplish all necessary evolutions. As to economy of money, a comparison, made in 1858, of the work of a much less perfect apparatus with the usual method of building, showed that an actual saving of eighty per cent had been effected.

THE difficulty between the New York master-plumbers and their journeymen is seemingly a more needless one than usual, and the question whether the business really belongs to the men or to the masters is certainly no less prominent than it has been in recent labor troubles. The masters have resolved that apprentices must be at least sixteen years of age; must read and write English, and understand the four cardinal rules of arithmetic; must serve five years, and must be under the sole control of the masters. The journeymen insist that a master may take only one apprentice for every four journeymen he employs; that the selection of apprentices be subject to the journeymen's association; that for the first three-and-a-half years of their apprenticeship they serve under the journeymen, and finally that all hands under twenty-four years of age shall be paid at least two-dollars-and-a-half per day. The only excuse we can see for the position taken by the journeymen is that they may fear that the masters may fill their shops with indentured apprentices, and so deprive the journeymen of their chance to earn a living; but as they must know that any plumber who did this would speedily lose his custom, we cannot look on the matter in any other light than as one more attempt to prove that so long as a given man does his own work and hires no man to do it for him, he is a holder of property and property rights, but that just so soon as he hires a laborer, his property and property rights pass to the man he hires, and he no longer has a voice in the direction of his own affairs.

THE courts are evidently to play an important part in these labor troubles, and if cases can only be brought in such form that a ruling can be arrived at, labor-reformers and their victims may learn with speed that the law can make short work with the sophistries of union leaders and club orators. Every one felt a doubt whether boycotting could be suppressed by law, and the labor-employing classes felt relief when one court after another found that boycotting cases could be punished as conspiracies. It is now to be discovered whether the law can

punish lock-outs as it can boycotts, for it is said that the locked-out clothing-cutters in New York have resolved to appeal for relief to the courts. The question of the legality of lock-outs is a much more complicated and more interesting one than the other, and we believe that a single ruling one way or the other would not be conclusive: each case would have to be tried on its merits without much reference to leading cases. With a single firm which for one motive or another saw fit to lock out its employés, we do not believe the law would ever meddle; but in cases where a number of firms have allied themselves for the sake of protecting their interests, it will be a matter of evidence whether the charge of conspiracy against labor could be sustained. If it can be shown that the interest of each member of the coalition would suffer in the same degree if the lock-out were not declared, the court would probably hold that no wrong had been done; but if it could be shown that only one member would suffer and that the other members joined in the lock-out only under the constraint of the conditions of alliance, then we do not see how a court holding that boycotting was illegal could do less than hold that this special lock-out was a conspiracy against the well being of the employés thrown out of work, and as such illegal.

WE are not at all opposed to the organization of labor unless there is too much of it, and unless the organizations effected for one purpose find it possible, and therefore are tempted to enter on coercive measures for the sake of unfair and unlawful aggrandisement of members or classes. We believe that until labor-unions have discovered that beyond certain limits the great unorganized public will not allow them to extend their control of every-day and common-place affairs there will be many conflicts with the law, which, though the final result cannot be doubtful, cannot but bring ruin on many men and many towns. It is a more insidious enemy of Republican or Democratic ideas than the movements of the professed anarchists, because every fair-minded person concedes to any class of men the right to coöperate for mutual protection and improvement. But every day brings fresh instances of the pernicious effects of the mania for organization, and shows how fast the unorganized public is finding itself reduced to an abject condition of subservience to unknown and unknowable laws, rules, and regulations enacted by small bodies of men who seek to enforce compliance with them whenever necessary by declaring a boycott. A particularly atrocious case of this kind has just been brought to trial in Cincinnati, on a claim for civil damages in $5,000, by a father who, his child having died of scarlet fever, being himself with his wife confined by illness to the room in which the child lay dead, sent a message to an undertaker to come and take charge of the burial. As no attention was paid to his message he sent to another undertaker, and then to a third, receiving no attention or explanation from any one. At length he discovered there was in the city an undertaker's union which had adopted a rule that no member should serve an individual who was in debt to any of the members, and that there was one undertaker who pretended to have a claim against him for eighteen dollars. As more than twenty-four hours had elapsed, and, as may be supposed in view of the nature of the disease and the weather, the case was urgent, the unfortunate victim, though denying the validity of the claim, was obliged to pay it, and then brought suit against the union. We devoutly trust he may win. Another case of boycotting, which seems to show more than ever that only cowards engage in it, and only when the victim is supposed to be helpless, is that of a Maryland woman who, when her husband died, found that her only resource lay in certain undeveloped beds of limestone. She at once erected lime-kilns, and was so successful in her operations that she developed a large business, and by so doing excited the envy of all the lime-makers in the vicinity, who thereupon combined against her and employed every legal and illegal device to bring about her ruin. At length, last week they addressed a letter to their customers at Baltimore stating that if any one bought lime of Mrs. Schaeffer they could not obtain lime from the members of the combination. Fortunately their Baltimore correspondents were men, not truckling knaves, and they at once wrote to Mrs. Schaeffer that they would take the entire product of her kilns. If the boycott could be faced in this manly fashion whenever it is attempted, this most un-American exotic could not long survive.

IN another part of this issue are given certain facts regarding the use of the automatic sprinkler in mills and other buildings. The system is one of the most important agencies in saving wealth to the world that has been discovered in recent years — but it has its imperfections and it occasionally happens that a building though thoroughly equipped with sprinklers will burn, as did the Glen Woollen Mill at Hampden, Mass., a week or two ago. On the same night, in another Massachusetts town, Pittsfield, occurred a very unusual kind of accident which resulted from the presence of the automatic sprinklers. Every one now knows that the essence of the system is a fusible metal which holds the valve of each sprinkler firmly to its seat until the general temperature of the room or of the part near a sprinkler has been raised to such a degree that the solder is melted and the water-spray comes into operation. The degree of heat required to fuse the metal depends on the composition employed. At Pittsfield a peculiarly sensitive alloy was used, and it appears that the heat accumulated in an upper room during one of our recent hot Sundays was sufficient to melt it and allow one or more sprinklers to come into play and have things all their own way until Monday morning, when it was found that a water-damage of more than two thousand dollars had been inflicted on the contents of the building.

SOME time ago, the manufacturers of lamp-black in the Black Forest, like other manufacturers of lamp-black everywhere, were troubled by frequent explosions, which occasionally proved fatal. No cause for them appeared, and an expert, Herr Engler, was commissioned to make a careful investigation of the matter. At that time it was thought by many that a cloud of any combustible particles, suspended in the air, could be made to explode. Air charged with flour in flour-mills, or with coal-dust in mines, often explodes with terrible effect, and there seemed to be reason to suppose that the fine dust of lamp-black, which is usually so disposed to chemical combination as to catch fire immediately on being touched with nitric acid, and often takes fire spontaneously from contact with the air, might behave like flour under similar circumstances. The apparatus employed in the investigation was very simple, consisting mainly of a long box, furnished with a gas-jet at one end and a tunnel at the other, with a wheel to distribute the dust into a cloud, filling the box. Many trials were made with the lamp-black, both crude and refined, so as to take away from the dust its tendency to adhere into flakes, but in no case was any explosion obtained, nor could the dust be even burned, except so far as the particles came actually into the influence of the flame. With flour, on the other hand, a tolerably lively deflagration was always produced, and with naphthaline or rosin-dust a sure explosion followed. Powdered sulphur burned quickly throughout the box, but neither charcoal-dust nor lamp-black suffered any change. Reflecting that the air in lamp-black furnaces is warm, Herr Engler repeated his experiments, both with this and with charcoal-dust, mingling them with air heated to a temperature of five hundred degrees Fahrenheit, but the result was precisely the same. The dust of soft coal is known to be very explosive, and Herr Engler concluded, as others have done, that unless the dust in the air is of such character as to give, by heating, combustible gases, it will not form with air an explosive mixture. Soft coal, when heated, gives off hydrocarbon gases, and flour produces similar ones, joined to others, and both these, when mixed in dust with air, explodes, while charcoal and soot, which produce no gas by heating, will not propagate flame when in that condition. Another series of experiments was then made, to see whether, if inflammable gas were supplied to the air from some other source, the charcoal and lamp-black dust would explode. The apparatus was connected with the city-service gas-pipes, and different proportions of ordinary carburetted hydrogen were admitted to mix with the air in the box. If eight per cent or more of gas were allowed previously to mix with the air, and dust of charcoal or lamp-black were then scattered through it, an explosion took place on applying a flame. If from three and one-half to eight per cent of gas were present, there was no explosion, but the box was filled with flame. If only two and four-tenths per cent of gas were present, there was no burning of the dust. As lamp-black furnaces very often contain hydro-carbon vapors, from the imperfect burning of the oil or other material used to make the lamp-black, the explosion of the dust in them, in presence of this gas, was easily explained, and the method of avoiding such explosions, by improving the combustion indicated.

MÜNTZ'S[1] RAPHAEL.—I.

MORE than once in these columns I have exploited the researches and verdicts of the distinguished author of the "*Life of Raphael*"—distinguished even among French writers on art. Whose touch so delicate, so *spirituel*, so thoroughly artistic as theirs—unless it be their congeners, the Italians? They enliven the dullest themes; they help the layman through the mazes of æsthetic lore, and over the arid stretches of æsthetic polemics, as only Frenchmen can. Comparatively our own efforts seem ponderous, verbose, and dry as dust. Our arguments fall like the blows of a sledge-hammer, while theirs penetrate like a rapier-thrust. One is inclined to smile ever and anon at their ingenuity, that suggests some fanciful hypothesis — more brilliant than discriminating — though this is a fault common, perhaps, to the profession in all lands; yet even were it peculiar to the Latin races, it is the more graciously condoned, as it is charmingly committed. Taking into consideration the now bulky mass of Raphaelesque literature, one would suppose that the last word had been uttered concerning the divine painter of Urbino; but the work before us confutes any such supposition. Fresh discoveries, new methods, broader sympathies have added—and will doubtless continue to add — a great many last words. Everything that throws additional light on the life, work and character of a genius so exalted, will always be eagerly scanned and religiously recorded. Apart from the mere gratification of our literary or æsthetic curiosity, nothing can be more edifying than the spectacle of a consummate artist's evolution, especially at the present moment, when, emancipated from the dogmas of a hieratic or academic past, we are ready to profit by whatever promises the most beneficial results. The modern reproductive processes would in themselves justify another "*Life of Raphael*," even were the text to remain unmodified. What perplexity, obscurity, and loss of precious moments does not an opportune illustration save? How much more facile and pleasurable is the digestion of M. Müntz's richly illustrated pages than the pictureless volumes of Passavant. We may quarrel with some of the reproductions, especially those from engravings and copies of the finished pictures, as being inadequate to a true representation of expression; but even these are perfectly satisfactory as to composition, and enable us easily to follow the printed description; while it is needless to say that the fac-simile reproductions of Raphael's studies and sketches are almost equal, for the purposes of investigation, to the originals themselves.

The opening pages of M. Müntz's book are devoted to a picturesque description of Urbino and its environs, as well as to a spirited estimate of the chivalric *condottiere*, Frederic of Montefeltro, protector of the arts and letters, and father of his people. Their "*Dio ti mantenga, Signore!*" [God preserve thee, Signor] was as genuine as it was spontaneous. His taste was both personal and catholic, for exclusiveness was not a characteristic of this golden age of the Renaissance. His eclecticism even prompted him to send for the Flemish painter, Justus of Ghent, and to the *chefs-d'œuvre* of contemporary art were added the priceless works of antiquity. Frederic died in 1482, the year before the birth of Raphael, and was succeeded by his son, Guidobaldo, who, from his earliest youth, evinced a marvellous disposition for study—a disposition that his subsequent patronage of art and literature did not belie. Like his father, he was brave and cultivated. Moreover, his gracious consort, the beautiful Elizabeth Gonzaga, ably seconded him in all his enterprises. In such an environment, so propitious for the development of the most generous sentiments, the most brilliant qualities, Raphael was born.

"Assuredly," continues M. Müntz, "had the painter of the Stanze and Loggia been a Florentine, he would have participated earlier in a more intense artistic movement; he would have acquired more rapidly a full knowledge of the secrets of his profession, as well as a more intimate acquaintance with classical antiquity, that fruitful source of progress. But it seems to us, taking all things into consideration, that he had but little to regret, as far as intellectual development was concerned, in being born at Urbino. It was important, in fact, that he should be able to commune with himself during his childhood in a calmer sphere, and to enjoy the beauties of nature while familiarizing himself with the rudiments of drawing. Urbino —and that was the essential thing — offered him very fair examples, thoroughly imbued with the spirit of the Renaissance. Subsequently it would be easy to fecundate these germs, and, in due time, to impart to his genius a bolder flight."

It is of interest to note that Raphael's paternal grandfather and great-grandfather, as well as his maternal grandfather, were tradesmen, or rather modest shop-keepers. The second kept a "variety store" in the environs, till he was driven into town by the savage Sigismund Malatesta, tyrant of Rimini. Raphael's mother, Magia Ciarla, brought to the *ménage* a dowry of one hundred and fifty florins (almost a thousand dollars), a very respectable sum, when it is considered that Lorenzo the Magnificent gave his daughters but two thousand florins. Raphael's father, Giovanni Santi, was a typical provincial master of the fifteenth century. "He is not yet the emancipated artist, by force of talent the equal of the warrior, the diplomatist, the prelate or the *littérateur*, but the modest and frugal *bourgeois*, ready to accept every commission, provided it be well recompensed, full of consideration for his relatives or neighbors belonging to other corporations — the draper, the tailor, the druggist. To judge him only by his daily occupations, one would be tempted to take him for an artisan rather than an artist. In fact he is seen by turns painting a banner for a procession, illuminating an escutcheon, gilding a wooden candelabrum; it may be that he has occasionally colored doors or windows. But be not deceived; this workman, apparently so humble, has travelled; he has studied the works of the most celebrated masters, he is thoroughly conversant with the secrets of his craft, he neglects nothing to acquaint himself with the latest methods. It would be an error to believe that his horizon is limited to painting; he has observed and read. He is familiar with the names of the humanists, Francesco Filelfo, Campano, Porcellio, Cristoforo Landino. More than that, he can handle the pen, and the composition of a poem has no terrors for him. The '*Chronique rimée d' Urbin*,' which Giovanni Santi composed in honor of the dynasty of the Montefeltro, still exists to prove, we do not say with how much talent, but at least with how much facility the artist could express himself in verse."

When his father died, Raphael (born March 28, 1483) was but twelve years old. The methods of instruction obtaining at this epoch were not identical with those of the preceding century as described by Cennini, though not dissimilar. Life was now faster, more intense, less contemplative; though doubtless mediævalism lingered in Urbino and the provinces long after it was extinct at Florence and in the great cities. Many of the artists of this period were extremely precocious. Mantegna, for instance, was only seventeen when he painted the "Virgin of S. Sophia of Padua." Michael Angelo, born in 1475, entered the atelier of Ghirlandajo in 1488, and sculptured, in 1489, the famous mask that attracted the attention of Lorenzo the Magnificent. Fra Bartolommeo, also born in 1475, was admitted to the atelier of Cosimo Rosselli in 1485. He was only about fifteen when he began to work for himself. Perugino commenced his apprenticeship at the age of nine. Andrea del Sarto was still younger when he was placed with a goldsmith, being only seven. Allowing about four years for apprenticeship, and as many more for collaboration, strictly speaking, at the age of sixteen an artist could have terminated his severe but rapid studies. And as I have frequently reminded my readers, there is no system of artistic training in any wise comparable to that of apprenticeship and collaboration, —precept and practice—under the eye of a sympathetic and paternal master. It is fair to assume that Raphael followed the curriculum then in vogue, and that before his father's death he acquired from him the rudiments, at least, of his profession. But let those who develop late take heart from Raphael's example; for, in the words of M. Müntz, "his development was slow and laborious, in direct opposition to Michael Angelo's, whose progress from the very first was proclaimed miraculous. And we would not have it otherwise. It gives us pleasure to discover traces of efforts, of hesitations, and—why conceal it?—of errors quite human, there, where for so long a time nothing had been seen except an uninterrupted series of triumphs savoring of the marvellous."

Taking the tastes of Giovanni Santi into consideration, it is more than probable that, besides a very careful artistic education, the son received some solid literary instruction. The Italian artists of the fifteenth century were less ignorant than is generally supposed. Compared with the autographs of the mediæval and renaissance artists published by Milanesi and Pini (Florence, 1873), that of Raphael is conspicuous for its correctness and elegance; it is very evident that he could manipulate the pen as well as the crayon. Besides these elementary acquirements, he doubtless learned the rudiments of Latin. The study of this language, which the Italians

[1] *Raphael, sa vie, son œuvre, et son temps*," par Eugène Müntz, Paris. Librarie Hachette & Cie., 1886.

still cultivate, and which they know almost as well as the vernacular, was not confined, in the fifteenth century, to a narrow set of professional scholars. In Frederic's time the whole court, including the prince's second wife, Battista Sforza, carried on their memorable discussions in Latin. Mantegna unconsciously mixed it up with his Italian. Benedetto da Majano kept a number of Latin books in his library, and Leonardo da Vinci constantly cited works written in the same language. Perugino, who was noted for his ignorance, would have deemed himself dishonored had he not signed and dated his pictures in Latin, and, wonderful to relate, all his inscriptions are correct. M. Müntz thinks that it may be assumed — till proved to the contrary — that he learned as much of this language as the majority of his *confrères*, and that it was not long ere he had read the Old and New Testament, Dante's "*Divine Comedy*;" perhaps, too, the "*Golden Legend*," and subsequently the "*Morgante Maggiore*" of Pulci. Still later he took from Virgil's "*Æneid*," the "*Metamorphoses*" of Apuleius, and Poliziano's "*Stanze della Giostra*," the subjects for important compositions.

Deprived, by his father's death, of a guide and protector, Raphael was compelled to witness some sharp discussions on family interests. But however bad their influence may have been, he was at least spared the spectacle of penury. His patrimony certainly was not sufficient to enable him to play the amateur; it was necessary that he should work to gain a competency. Yet he certainly must have appreciated the advantages that his situation, modest though it was, gave him over many of his *confrères*. It was a great blessing to be able to pursue his studies in peace without worrying about the morrow, as would soon be exemplified to him by the conduct of his future master. Perugino — if we may trust Vasari — was in such want that he slept for months on a wooden chest. He braved cold, hunger, fatigue, and even shame, to become rich. None more than he sacrificed the dignity of art to the love of gold. "So true it is that poverty often abases the noblest talents, if it does not break the energy and degrade the character."

The old theory that Raphael entered Perugino's atelier in 1495 has, owing to the researches of M. Springer, been abandoned, and for the best of reasons — because Perugino was not in Perugia for any length of time, from 1493 to 1499. Towards the close of the latter year he returned home to execute the famous frescoes of the Sala del Cambio, and in all probability Raphael then became his disciple. It is supposed that Raphael studied in the meantime at Urbino, under his fellow-townsman, Timoteo Viti, pupil of Francia. A warm and lifelong friendship was there formed between the two. In his more splendid days the great painter was not oblivious of his early companion. The indirect influence of the architecture and paintings in and about Urbino on the young student must have been considerable. His drawings from the philosophers by Justus of Ghent in the library of the Palace are still extant. The beautiful palace itself, so pure and harmonious in line, the work of Luciano da Laurana, must certainly have left its trace on his receptive mind. It is pretty certain, too, that he studied, among others, the paintings by Melozzo da Forli, Fra Carnevale, Piero della Francesca, Signorelli's banner, painted in 1494 for the church of Santo Spirito, and finally the prints of Mantegna and Martin Schoen.

Almost every traveller will recall the inspiring landscape of Perugia. Perched on a lofty summit, its slopes thickly dotted with villas, vines, and misty olives, it commands a mighty view of fertile plain, and waves of rugged mountain forms, undulating like the sea. Such stimulating vistas must have greatly moved the impressionable Raphael, for do we not constantly find souvenirs of these glorious views in his earlier works? While on the one hand the aristocracy was ferocious to a degree, on the other the people were gentle, humble, and warmly attached to the beliefs of a by-gone age. This was not the land for strong emotions, but rather for religious meditation. The Umbrian type suggests the madonnas of its school, that charm rather by beauty of expression than by regularity of feature. Though not without its university, and its distinguished men of letters, Perugia had but little to offer in the way of intellectual resources as compared with the brilliant court of Urbino. Of such a country and such a people Perugino, pictorially speaking, was the spokesman. Notwithstanding his long sojourn at Rome and Florence he always remained profoundly attached to the Umbrian tradition. Though he introduced new elements, and carried to a perfection hitherto unknown the science of color and perspective, he always remained the painter of sweet meditation, and divine ecstacy, the painter *par excellence* of saints and madonnas. Whether or not he was a sceptic, as Vasari asserts, whether or not a belief in the immortality of the soul could ever penetrate his train of "porphyry," it must be averred that no one ever rendered the pathetic, tender, and almost feminine religious sentiment more admirably. Such an art tallied exactly with the ideals of his compatriots, and they wanted no other. As in Byzantine art, certain types were consecrated, and any deviation would have been unacceptable, which, in a measure, accounts for the master's uniformity — though not entirely. Here we have an example of a popular art that in the main was good. Humble artisans deemed themselves well recompensed for a life of toil and privations could they but endow their church with a beautiful picture — a Perugino, for instance. To a young and generous nature such examples were very inspiring, and it was fortunate that Raphael could imbrue himself in the vital sources of popular sympathy. The works that he produced later in Rome, amid a burst of applause, are certainly more learned and beautiful: but are they as touching?

Perugino was in the hey-day of his career when he was commissioned to decorate the Cambio. It was then that Raphael entered his atelier. The conditions of apprenticeship and companionship, or collaboration, towards the close of the fifteenth century, are tolerably well known. The contract of apprenticeship generally imposed on the parents a considerable expense. But the master on his part agreed to lodge, nourish, and instruct the pupil, as well as to replace his worn-out clothes. The conditions of companionship were naturally more favorable for *débutants*. Instead of paying the master (after, perhaps, a year's probation without pay), they were remunerated by him according to their deserts. It is probable that Raphael, who was at that time about seventeen years old, sought Perugino for advice and direction rather than for elementary instruction, and entered his atelier as a collaborator, or *garzone*, not as a pupil, or *discepolo*. At all events, the best authorities admit the collaboration of Raphael on the frescos of the Cambio.

According to Vasari, Perugino was quickly fascinated by Raphael's skill, seriousness, and amiability, and the issue justified his predilection. On the other hand the pupil requited the master's affection. Thenceforth the cordiality of their relations never changed. Among other well-known painters working at this time in Perugia were Fiorenzo and Pinturicchio, Giannicola Manni, author of the frescoes in the chapel next to the Sala del Cambio, and Andrea Luigi, surnamed Ingegno, a celebrated artist in his day, but whose rôle has not yet been clearly defined. Perugino had gathered about him a goodly number of pupils, on some of whom Raphael cast a potent spell; on Domenico Alfani, of Perugia, for example, on Girolamo Genga and Giovanni di Pietro, surnamed Lo Spagna, who were later enrolled among his collaborators at Rome.

It is not always an easy matter to catalogue correctly the pictures that issued from Perugino's atelier between the years 1499–1502 (and the best authorities differ); for Raphael assimilated all that he could of Perugino's style, even his mannerisms. But there is much less chance of confounding their drawings, for Perugino's "are infinitely more archaic" and full of carelessness. Raphael's, on the contrary, are scrupulously exact — an exactness he maintained to the very last. "When Raphael left his master, in 1502, he had learned all that the old Umbrian could teach him. Oil and fresco painting had no secrets for him. Later, certainly, his brush acquired more freedom and power, but it lost, also, some of its qualities; the general tone was less amber-like, less warm and luminous than in his first attempts, imperfect in so many respects. If from the point of view of color Perugino exercised on his pupil a most salutary influence, from the point of view of drawing his action was far less fruitful." Vasari (who has his likes and his dislikes) says that it was only with the greatest efforts he rid himself of Perugino's dry and poor style of drawing, and that "he learned to render the beauty of the nude and the secrets of foreshortening by studying the cartoon painted by Michael Angelo for the Sala del Consiglio, at Florence."

After referring to the influence exercised on the young painter by Pinturicchio and the neighboring works of Signorelli (1441–1523) as evinced by the famous sketch-book of Venice, M. Müntz discusses at length the authorship of these drawings. Though a majority of the savants attribute them to Raphael, there is a strong dissenting minority, including the ingenious Morelli (who assigns them to Pinturicchio). It would be impossible here to recapitulate the *pros* and *cons;* merely let it suffice me to say that M. Müntz makes a very strong and (as well as one can judge without making personal investigations) apparently convincing argument in favor of Raphael's authorship. The young artist was nineteen years old when he began to work on his own account. Umbria had become to him a second fatherland. Thanks to the liberality and sympathy of its people — and warmly recommended, doubtless, by the overworked Perugino — he now executed several of those pictures, modest in size, as was natural for a beginner, that have since been so justly admired, such as the "Madonna Solly," of Berlin, the "Madonna Staffa Conestabile," of St. Petersburg, etc. These commissions were necessary to save him from the isolation, the uncertainties, and the many struggles to which his master's departure exposed him. The status of an artist at the close of the fifteenth century is too interesting and suggestive to be ignored. Modern investigation has drawn aside the old veil of romance and discovered Raphael living the life of his master and his *confrères* — a life essentially humble and *bourgeois*. It cannot be too often reiterated that the Renaissance but tardily sanctioned the emancipation of architect, painter, and sculptor. Till the commencement of the sixteenth century the most celebrated masters were constantly confounded with the artisans, or rather artists and artisans were one and the same. If they were treated with *hauteur* by their patrons, if interminable solicitations were necessary to obtain the smallest payments, it was in a measure due to the fact that they were unable to elevate their characters to the level of their talents. Yet it must be borne in mind that their endless complaints of poverty were in most cases but mere conventional phrases. It required the powerful genius of Bramante, Leonardo, Michael Angelo, and Raphael, as well as the ardent initiative of Julius II and Leo X to triumph over the old prejudices, and to make this disinherited class the peer of other representatives of thought. Shortly afterwards third-rate artists bedecked themselves with the titles of professor, chevalier, academician. But at the time of which we write in Umbria it was far different. The greatest of painters was simply "Master Raphael of Urbino" — and he painted *chefs-d'œuvre*.

Some of the stipulations that controlled the painting of a picture

or fresco in those days seem very odd to us moderns. Generally, the price was settled in advance, the painter furnishing everything save gold and ultramarine, an exception that caused endless discussions. Payments were not infrequently made in kind. Sometimes the contract mentioned a supplementary fee, optional on the patron's part. Sometimes the artist, even the most celebrated, worked by the day or month; often he was boarded and lodged during the execution of the work. At other times no price was agreed upon in advance, but the completed work was appraised by an expert. Raphael preferred this system. His "Sibyls" in the Pace, by the way, were valued by Michael Angelo.

It would be an agreeable and profitable task, were it possible, to note every off-shoot from Raphael's budding genius; to observe the slowly-fading reminiscences of Giovanni Santi and Perugino; to vaunt the superiority of the pupil's to the master's "Sposalizio;" to signalize the important rôle played by landscape in his pictures; to watch him, now drawing from his comrades (in default of a female model), in their scant costumes of the epoch, for an ulterior figure of virgin or saint, and now from a skeleton; though quite capable of creating them from his imagination. As a combined result of temperament and education he arrived at the expression of feminine beauty long before he mastered the masculine qualities. He was apparently born to depict angels and madonnas. It is almost pathetic to witness his rendering of the famous "Three Graces," or rather his translation of it into Umbrian vernacular, during his sojourn at Siena, whither he was invited by Pinturicchio, to make sketches for the latter's frescoes in the cathedral library — but not to work on them. In 1504 he returned to his native Urbino, and joined the brilliant throng, so eloquently described by Passavant in his "*Life of Raphael*," that frequented the court of Guidobaldo and Elizabeth.

FREDERIC CROWNINSHIELD.

[To be continued.]

AN EDITOR'S TRIP ABROAD.[1]—XII.

A SOCIALISTIC DEMONSTRATION AT GHENT.

Medallion on the Palace of the Legion of Honor, Paris. Clodion, Sc. From La Revue des Arts Decoratifs.

BELGIUM is, above all, the country of political freedom. We pride ourselves on being able to say anything we like, in public or in print, without fear of being called to account for it; but the habit of speaking and acting with some sort of moderation and decency is so ingrained in the Anglo-Saxon constitution that we rarely have occasion, except when a Herr Most rises up among us, to try whether we really possess that forbearance toward political lunatics and their ravings which the Belgians have so long and so conscientiously maintained. Whatever may be said of the wisdom of this attitude of universal toleration, it certainly helps to give flavor to the political contests of the country, which seem to rival our own in a picturesqueness which commends them greatly to the tourist in search of distractions.

As we left the hotel this afternoon, on our way to visit the place where the noble statue of Jacob van Artevelde, to give him his real name, overlooks the scene of those turmoils which made him and the fierce citizens whom he ruled perhaps the most conspicuous figures in the history of their time, we were rather startled at coming upon a procession of men carrying red flags of all sizes, some surmounted by liberty-caps and others not, alternating with boards painted with inscriptions breathing sentiments quite unfavorable to property and privilege, and demanding, peremptorily, that the working-man should have his rights restored to him. Having just seen Amsterdam almost in a state of siege, after the bloody Socialist riot of the 26th of July, which occurred on the day before our arrival there, we were quite ready to share the apprehensions of the native spectators of this new demonstration, who had prepared their minds for the worst. However, the appearance of the participants in the procession was so amiable that we concluded that their anarchist animosities had not yet been excited, and that it would be safe to stay and watch them. The advance guard consisted of a platoon of small girls, probably volunteers, who danced and squealed like a chorus of infant bacchanalians, but the rest of the train consisted entirely of men, some in blouses, but more generally dressed in a decent Sunday costume, which contrasted rather curiously with their blood-red banners. After the first body, which contained a large number of men, and was probably a political club, came a number of regularly-organized working-men's societies, many, if not most of them, being for charitable purposes. These, like the rest, had been furnished with red flags and Phrygian caps; but their society names, which they carried on small banners, contradicted sufficiently the revolutionary emblems which floated beside them to take away much of their terror. The burden of the greater part of the placards carried in the procession was a demand for universal suffrage, the "remedy for the sufferings of working-men," as one of them called it, but, particularly toward the head of the line, there were the Flemish equivalents for some of the stock Socialistic formulas about the working-man's claim to all property, on the ground that he and steam had made it, and so on, with calls for the immediate abolition of privilege and class distinction.

On the whole, it was not a very formidable affair, and the sober, honest faces of most of the working-men who composed the train took the terror quite out of their sanguinary emblems, so that we were not at all surprised to read in the papers the next morning that, although the troops were kept under arms all day, in readiness for immediate service, they were not called upon to shoot, or even to frighten anybody.

Not caring to be too near any possible disturbance, as soon as the red-flag procession had got well out of hearing in one direction, we took the other, and, after passing, as in duty bound, through the ancient region around the Marché du Vendredi, we turned easterly, and soon arrived at a place where an anti-Socialistic demonstration, quite as interesting as the one we had just seen, and a good deal more picturesque, was going on. The people of Belgium are, as a rule, very religiously inclined, and where, as in this instance, the priests consider it necessary to make a political exhibition, they have the means and influence for doing so very effectively. It is not wonderful that priests, with revolutions and communes in their minds, should look upon the political movement of working-men, especially when made under the shadow of red flags, as attacks upon the church, and they naturally give their counter-demonstration a strongly religious character. As we came toward the open spaces beyond the theatre, we saw certain streets decorated with numberless flags, and, guessing that this indicated a procession, we walked through a portion of the route, finding the houses everywhere nearly covered with flags, colored draperies, branches of evergreen, and paper flowers, while hundreds of banners hung across the streets. Most of the flags showed the red and yellow and black stripes of Belgium; but there were a good many in two stripes, of white and yellow only, while the banners had usually some sacred picture or symbol upon them, and in the first-story windows of nearly every house, and often in those of the other stories, also, were pictures or statuettes of some kind, with candles in front of them, ready to light. The two most richly-decorated streets, which were rather narrow, and seemed in perspective a mass of bright color, led to an open place, where a portable altar, consisting of a table with a sort of triptych reredos, so arranged as to fold up into a box, instead of quite flat, had been set up on a temporary platform, covered with carpet. The structure was richly carved and gilded, and the reredos, as it stood open, showed very effective paintings above the bouquets of natural flowers and the rows of candles which decorated the altar. This, as we learned from the conversation of the people about us, was for the ceremony of blessing the procession, which was expected to arrive before long. Not knowing how many minutes or hours they might have to wait in the crowd, the ladies concluded not to stay, and after conducting them to the hotel, I hurried back, just in time to find all the candles in the windows lighted, and the procession passing. Unlike the Socialist cortége, in which the vanguard of ragged girls was the only feminine element, that of the clerical-administration party was largely composed of women and girls, whose effective dress and sober demeanor added much to the impressiveness of the scene. The first body, composed mostly of policemen and young priests, who seemed to have the management of the affair, was followed by a band, and this by companies of children, probably from the church schools, dressed in different uniforms, and carrying banners. The smaller ones came first — the boys with faces newly washed and hair neatly brushed, and the girls with white dresses, and veils and wreaths on their heads — and then came the older ones, who wore similar costumes, but, in addition to their banners, many of which were beautifully embroidered in colors and gold, carried colored statues, in wood or composition, nearly life-size, usually representing what seemed to be some incident in the life of the saint whose intercession was invoked by the inscription on the banner which followed immediately after. As the procession advanced, the people in the streets strewed before it showers of bits of gilt and colored paper, and green rushes, which covered the pavement like a carpet, and gave the movement of the participants, and of the crowd of spectators, a noiselessness which was of itself a rather striking feature of the scene, and added materially to the solemnity which the managers evidently wished to give it, and which they increased by the skilful manner in which the order of the train was arranged. After the school-children, with their veils and wreaths, had passed by, came a troop of three or four hundred young women, dressed in black, with long veils, and carrying the instruments of the Passion, and after them several more religious societies of women, all dressed in black, with veils of white, or black, or purple, as the case might be, and carrying sacred images or emblems, with banners of increasing splendor. Then came corresponding societies of men, some, apparently, being bodies of seminary or college students, in uniform, while others were composed of laymen, without uniform, but carrying very rich banners, with crosses and other emblems, apparently of silver. Following these was a company of priests, carrying a banner, one or two figures of a saint whose name I could not see, and what seemed to be a huge silver reliquary, with small glazed openings in the sides, and something set up against the glass. Then came thirty or forty elderly and handsome men, in lay costumes, all carrying lighted lamps, apparently of silver, attached to poles, the upper portion of which was also covered with silver. The lamps were of various forms, but the workmanship of all was extremely rich. Next came another body of priests, in magnificent robes, carrying banners

[1] Continued from page 111, No. 558.

loaded with gold embroidery, and chanting a hymn, and behind these was visible a cloud of smoke, surrounding a silver box, three or four feet square, over which was a silver canopy. As the chorus of priests advanced, there was a movement in the crowd of spectators, and the men took off their hats and held them in their hands; and when the silver censers appeared, accompanied by the ringing of little bells, nearly all those who had room to do so knelt upon the pavement until the Host had passed.

I could not be contented without running through a cross street to another point in the route of the procession, to witness again the solemn spectacle, which surpassed in impressiveness anything in the way of a peaceful political demonstration that I had ever seen. Indeed, I should hardly have believed it to be simply political if it had not been followed by the appearance of men selling popular Conservative newspapers, together with cheap lithograph portraits of the present Ministry, and of one or two pleasant, well-dressed individuals, who seemed to take great interest in conversing with the inhabitants of the small houses along the streets. I bought the Ministers' portraits, and a copy of the paper, which, so far as I could translate its Flemish, contained sentiments toward the Radicals and Socialists quite as uncharitable as those which the Socialist banners had expressed toward the present order of society, notwithstanding the superior Christianity which it so loudly claimed for its own party. Judging, however, from the appearance of the persons engaged in the two demonstrations, the Conservatives seemed to have a decided advantage in point of ability and intelligence. In these days one ought to be at liberty to criticise the appearance of a priest as a man, apart from his sacred office, and those who walked in the procession had, almost without exception, an air of refinement and force of character very different from that which one often sees in the Catholic clergy. If the rest of the priests in Belgium are like those of Ghent, there is nothing surprising in the great influence of the clerical party in the country, and it is, perhaps, not impossible that its leaders, through the exercise of the patience and forbearance which the Church inculcates, may be the first to attack with success the Socialistic windmill which so many political knights in Europe, some with soft words, and some with lances in rest, are trying to dissuade from brandishing its frightful arms.

THE ILLUSTRATIONS

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

UPPER STORIES OF STORE, BEDFORD STREET, BOSTON, DESIGNED FOR F. L. AMES, ESQ., BY H. H. RICHARDSON, ARCHITECT.

[Gelatine print issued only with the Imperial and Gelatine editions.]

BUILDINGS DESIGNED BY THE LATE H. H. RICHARDSON, ARCHITECT.

ILLNESS cut short the task we had set ourselves of preparing a memorial issue of the *American Architect* which should contain such personal tributes to the late H. H. Richardson as his friends and fellow-architects desired to pay. When we were once more ready to go on with the work, we learned that his immediate friends desired to have prepared a more elaborate memorial biography, and as there seemed to be a feeling that what we proposed to do might be in some way prejudicial to the success of the more serious enterprise, we willingly abandoned our undertaking and placed at the disposal of the biographer selected, Mrs. Schuyler Van Rensselaer, the material already collected. As this could not apply to the sketches we had had prepared of the most important of Mr. Richardson's buildings they are published in this issue without comment or description.

As a matter of record we here append an imperfect list of the most important of Mr. Richardson's buildings:

Episcopal Church at West Medford, Mass.
Western Railway Office-Building, Springfield, Mass.
Church of the Unity, Springfield, Mass.
Agawam Bank Building, Springfield, Mass.
House for Hon. Wm. Dorsheimer, Buffalo, N. Y.
Insane Asylum, Buffalo, N. Y.
Exhibition Building, Cordova, Argentine Republic.
Brattle Street Church (now First Baptist), Boston, Mass.
High-School Building, Worcester, Mass.
Cheney Block, Hartford, Conn.
Trinity Church, Boston, Mass.
Phœnix Insurance Company's Building, Hartford, Conn.
Hampden County Court-house, Springfield, Mass.
House for Mr. B. W. Crowningshield, Boston, Mass.
North Congregational Church, Springfield, Mass.
House for Mr. W. Watts Sherman, Newport, R. I.
State Capitol, Albany, N. Y.
Winn Library, Woburn, Mass.
American Express Building, Chicago, Ill.

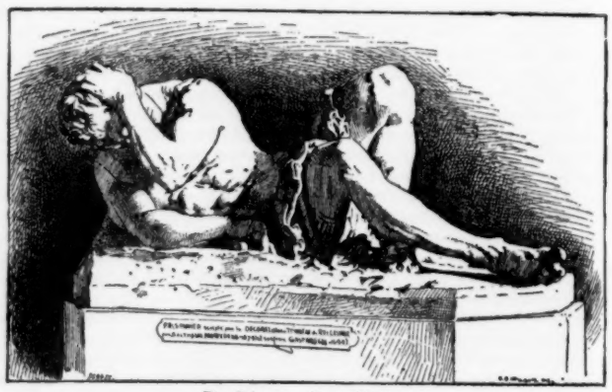
The above were executed while Mr. Richardson was in partnership with C. D. Gambrill.

Sever Hall, Harvard College, Cambridge, Mass.
City-Hall, Albany, N. Y.
House for Mr. F. L. Higginson, Boston, Mass.
Trinity Church Rectory, Boston, Mass.
Ames' Monument, Sherman, Wyoming Territory.
Store for Mr. F. L. Ames, Bedford Street, Boston, Mass.
Store for Mr. F. L. Ames, Washington Street, Boston, Mass.
Dairy Building, Boston & Albany R. R. Co., Boston, Mass.
Ames' Memorial Library, North Easton, Mass.
Ames' Memorial Town Hall, North Easton, Mass.
Railroad Station, North Easton, Mass.
Gate-Lodge for F. L. Ames, North Easton, Mass.
Station for Boston & Albany R. R. Co., Auburndale, Mass.
" " " " Chestnut Hill, Mass.
" " " " Palmer, Mass.
" " " " South Framingham, Mass.
" " " " Wellesley Hills, Mass.
" Connecticut River " Holyoke, Mass.
Austin Hall, Harvard College, Cambridge, Mass.
House for Mr. Grange Sard, Jr., Albany, N. Y.
Crane Memorial Library, Quincy, Mass.
House for Mr. N. L. Anderson, Washington, D. C.
Billings Library, Burlington, Vt.
House for Hon. John Hay, Washington, D. C.
House for Mr. Henry Adams, Washington, D. C.
Converse Memorial Library, Malden, Mass.
Newton Baptist Church, Newton, Mass.

The following buildings were under construction at the time of Mr. Richardson's death:

Allegheny County Court-house and Jail, Pittsburgh, Pa.
Store for Mr. Marshall Field, Chicago, Ill.
Armory Building for Estate of J. J. Bagley, Detroit, Mich.
Cincinnati Chamber of Commerce, Cincinnati, O.
House for Mr. Franklin MacVeagh, Chicago, Ill.
" " J. J. Glessner, Chicago, Ill.
" " B. H. Warder, Washington, D. C.
" " R. T. Paine, Waltham, Mass.
" Prof. E. W. Gurney, Beverly, Mass.
" Dr. H. J. Bigelow, Oak Hill, Newton, Mass.
Station for B. & A. R. R. Co., Washington Street, Newton, Mass.
" " " Beacon Street, Newton, Mass.
" " " Boylston Street, Newton, Mass.

AMERICAN ARCHITECTURE FROM A FRENCH STANDPOINT.



The Prisoner. From L'Art.

FOR a long time past I have been desirous of answering your invitation by sending you from France some notes which may be of interest to the numerous readers of the *American Architect;* but many occupations and a protracted tour into Italy have not allowed me to put my project into execution at an earlier day. On the other hand, when I come to the moment of writing I find myself much embarrassed.

Your estimable journal, which I have scanned with a lively interest, appears so completely *au courant* with everything that transpires on our side of the Atlantic, that I ask myself, what subject is there proper for me to touch upon? Not only the text of your journal keeps its readers posted as to all which can be of interest to them, but also the sketches, which are very adroitly executed — I have especially remarked those of Messrs. Blackall and Mead, place before them, while preserving very perfectly their special physiognomy, the edifices of our Old Europe. In very truth I can profit much more by the study of the *American Architect* than my American *confrères* can benefit by any notes or reflections which I shall have the leisure to address you.

In fact, your journal gives me complete information of all that is done in your country, and I find in the works of all kinds which are carried on there subjects for observation which it would be difficult for me to make in our ancient classic soil. Your modern structures

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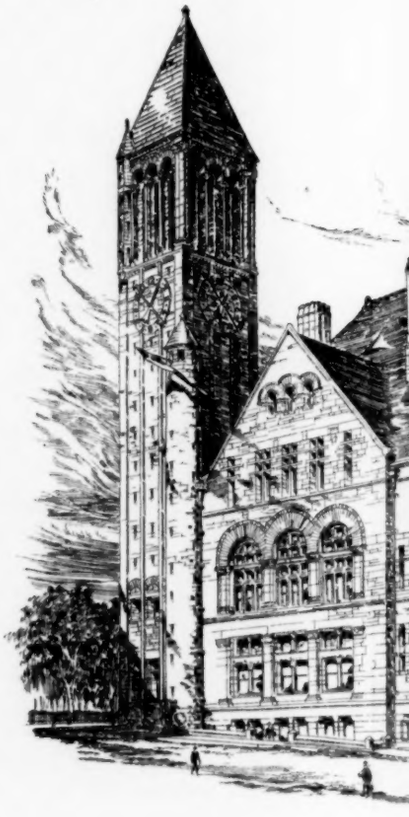
H. H. RICHARDSON, ARCHITECT.

COURT-HOUSE, PITTSBURGH, PA.



CITY-HALL, ALBANY, N.Y.

CHAMBER-OF-COMMERCE, CINCINNATI, OHIO.

(AFTER ARCHITECT'S DRAWING.)

LIBRARY, WOBURN, MASS.

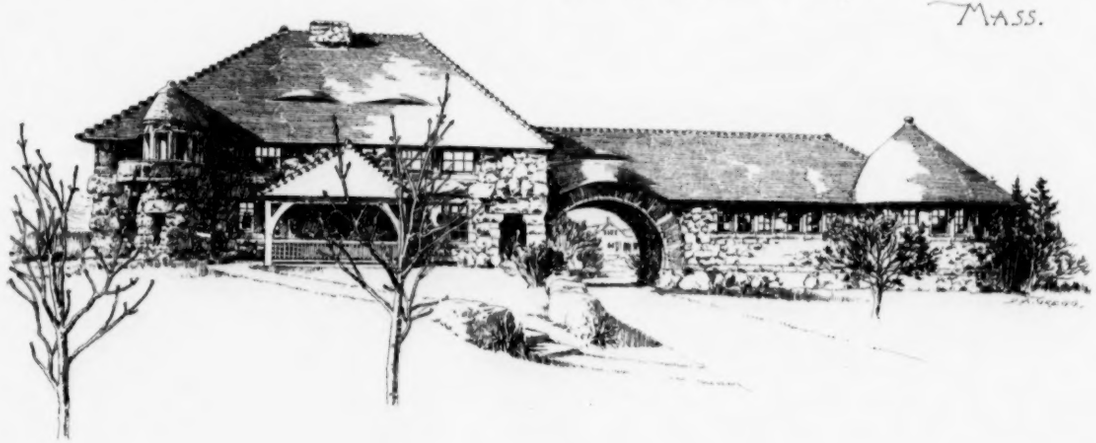
BANY, N.Y.

TOWN-HALL,
NORTH EASTON, MASS.

"BRATTLE SQ^RE" CHURCH
BOSTON, MASS

Heliotype Printing Co Boston.

GATE LODGE · NORTH EASTON · MASS.



NORTH CHURCH
SPRINGFIELD · MASS.
(Gambrill & Richardson)

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COURT HOUSE SPRINGFIELD MASS.
(Gambrill & Richardson)

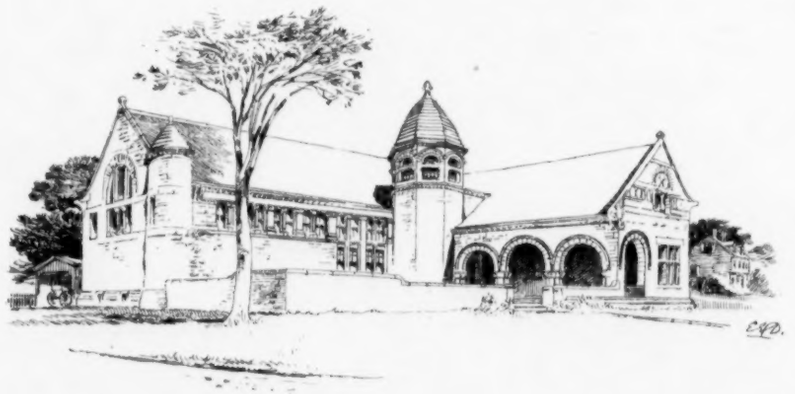
TRINITY CHURCH RECTORY.

CHENEY BUILDING HARTFORD

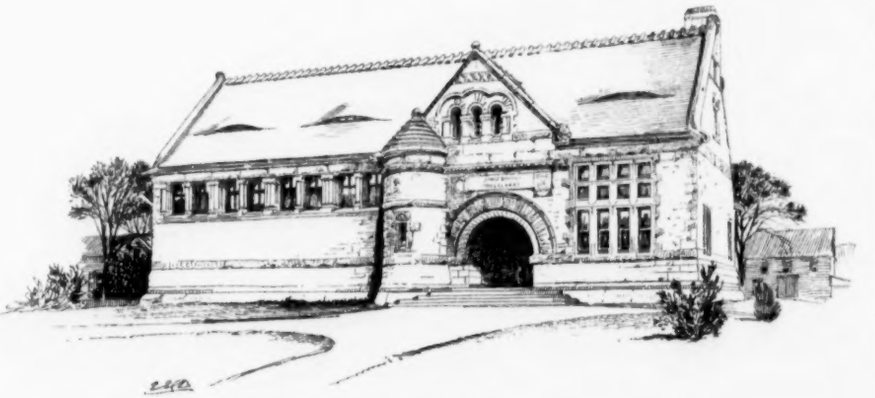
TRINITY CHURCH
BOSTON. MASS.
(Gambrill & Richardson.)

The Law School : Harvard University.
Cambridge. Mass.

Sever Hall
Cambridge. Mass.



Converse Memorial Library.
Malden. Mass.



Crane Library
Quincy. Mass.

Heliotype Printing Co. Boston.

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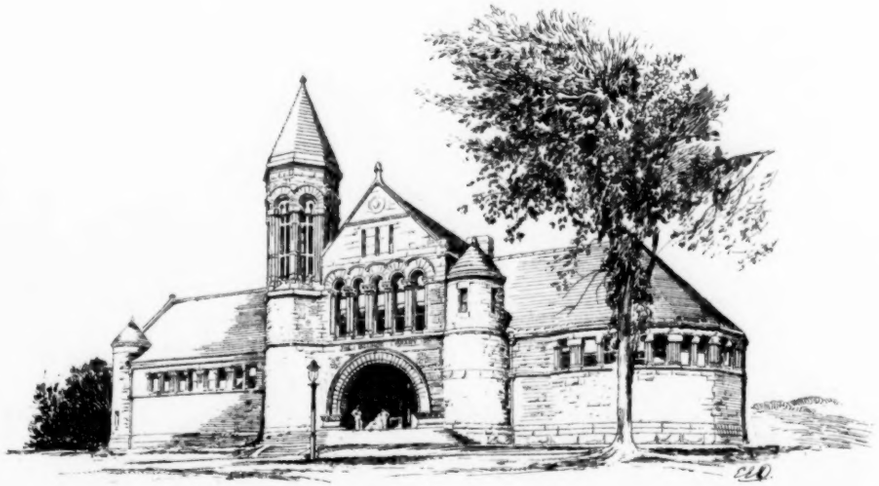
H. H. RICHARDSON, ARCHITECT.



Billings Library
Burlington, Vt.

Library
North Easton, Mass.

do not, I confess, give me complete satisfaction. I see in them the old European styles employed a little confusedly and often in a fashion which does not seem to me justifiable. As to the Classic orders which are derived from antiquity, they do not appear to be sufficiently understood as form nor studied as details. The exterior forms ought not to be merely an adornment, they ought to represent a function. There are æsthetic laws which are and will be of all times and of all countries, and to neglect them is to deprive one's self of the most essential elements of beauty. Besides, in order to appreciate with surety the value of a monument it is not sufficient to examine the façades, it is necessary to discover if they are the interpretation of the plan, — if they are in harmony with the character of the edifice.

Now at a distance it is very difficult to judge of all these things. Nevertheless, at the risk of finding myself mistaken, I think I may be allowed to say that the monumental character, such as we French architects understand it, that is to say, the harmony of forms with the *raison d'être* of the building is not the dominant preoccupation of American architects. I conceive that they especially seek varied aspects, even when these aspects are little in accord with the real function. From this, it is true, often results the unexpected, which, to be sure, has its own charm. Moreover, little troubled by tradition or the teachings of the schools your architects have sometimes an audacity which is astonishing, but which also may lay the groundwork of a more modern style by presenting new solutions for new problems. It is the right, perhaps, of a young nation like yours to cast in the old archaic moulds the elements of an architectural Renovation.

It may be that for the moment you are in the midst of a period of study, of experiment and attempts of which your monumental art gives witness. But your artistic enfranchisement will come perhaps from another side; for without delaying longer over these risky suppositions I prefer to tell you at once that if half the American buildings which aim at the monumental make me shiver, on the other hand, I am wholly seduced by your buildings of a domestic and private character. These constructions recommend themselves by a fancifulness, a picturesqueness which is truly charming. Here I find an art truly individual which does not find its equivalent with us. I recognize, nevertheless, that it proceeds in great measure from what is done to-day in England, in that new style, so much in fashion, called Queen Anne, without much reason I believe, and also from those rural constructions where a free employment of wood is permitted, which are inspired by the half-timber houses of the fifteenth, sixteenth and seventeenth centuries in England. But if in this you follow the English fashion, it is for the sake of appropriating for yourselves and making out of it something quite personal which has for us Europeans a very special flavor.

I do not disguise then my quick appreciation of the residences, houses, cottages, lodges, etc., which with you represent the habitation. One detects in them comfortable interiors, the family-life well protected and concealed: consequently there arises from these peaceful habitations, of a guise at once modest and coquettish, a perfume of the poetry of home-life which takes possession of one at once.

After this declaration of my sympathy, let my American *confrères* allow me to express some criticisms which are the result of a more sober examination. If the first impression is excellent, the second one tends to diminish it. One feels disposed little by little to discuss that which at the outset constituted the charm of this first sensation. One is seduced by these simple habitations, sheltered by vast roofs, of which the very eccentric plan seems to indicate from the outside rooms disposed so as to suit the habits of the family, and not for the sake of satisfying those vain rules of symmetry which are foreign to the needs of daily life. The absence, often affected, of every kind of consecrated architectural form and consequently the simple accentuation of the materials as decorative elements, rest the eye weary of false and pretentious decoration. In a word, it is the very simplicity of form, a certain *naiveté* in the construction and the picturesque aspect of the whole which constitutes the charm of these habitations. But from the affectation of these qualities, from a natural tendency to develop without limit the consequences of a good principle there result exaggerations which cannot be praised. Sometimes your country houses appear to be no more than lumbering peasants' houses buried under enormous roofs. The low ground floors seem plunged into the shade of porticos, verandas and projections of every kind which envelop the construction. The stories above necessarily find themselves inconveniently housed in the roofs which they penetrate in the form of dormers of every style and dimension. Besides, there is no relative proportion between the different parts of the whole: there is no common measure between these motives placed side by side and not bound together by a common origin. Inside, the irregularity of the arrangement seems to be more sought than absolutely necessary. The rooms interpenetrate one another: they jut out at every opportunity, making angles more *bizarre* than agreeable. All this without their seeming to be justified by real needs. The construction itself is exaggerated. The most rudimentary outlines are sought out, there are rustic walls with excessive rustication. The method of building no longer seems the logical and harmonious disposition of materials. In short, all art seems to be laid aside. It is no longer architecture. It is only construction more or less ably disposed to catch the eye by unexpected combinations, and not to charm by a fixed and continuous style.

Here is, it seems to me, a danger. We ought surely to admire the picturesque, but not always at the expense of the most elementary logic. Picturesqueness surely ought not to lead to the neglect of the essential laws of general harmony. People will be wearied as quickly of these exaggerations of the moment, as with a fashion without reason. Then the rectangular and cold constructions will have their revenge on the charming habitations which please us so much to-day.

In a style which is at once free and measured, I enjoy much the works of Mr. Hunt in the houses of Mr. Marquand and Mr. Vanderbilt. This elegant and distinguished architecture recalls to mind, it is true, certain fine specimens of our French Renaissance. Nevertheless, Mr. Hunt seems to have admirably accommodated them to the exigencies of life in your country.

But I am forgetting myself. I ought to tell you something of ourselves and of our works; and here I have allowed myself to enter on a criticism of architecture which the *American Architect* has placed under my eyes. My excuse must be found in the interest which I found in it; and I hope that American architeets will pardon these criticisms, necessarily slightly formulated but well intentioned.

I will close by telling you something of our annual *Salon*, which closed on the thirtieth of last June; not that we must search there for a complete presentation of the efforts and tendencies of our contemporary architects. The exhibition of architecture is not like its neighbors, the exhibitions of painting and sculpture. There, doubtless, we find works from the greater number of our best painters and sculptors: few absent themselves. So, beside the great decorative works executed in our buildings, we see in the exhibitions of painting and sculpture the faithful expression of the artistic preoccupations of the moment. But it is not so with the exhibition of architecture. The architects who are the busiest, the most pushing, have little leisure to take part. They would with difficulty find the time to send thither, as is the usage to-day, numberless superficial metres of drawings to represent some of their executed works or some in course of execution. Besides, these drawings would necessarily be in great measure the work of numerous assistants. Moreover, the geometrical representations in use with us express very imperfectly the perspective effect and the *ensemble* of buildings which each one can appreciate at his leisure in execution. It is therefore on the public street that we make the greater part of our annual exhibition of architecture.

If I add that many other architects who have a great reputation acquired by real merit are not willing to risk it by sending drawings, long and difficult to make, and which demand to-day physical faculties and a skill with the pencil and brush which do not belong to every age, you will understand why our exhibition of architecture is limited almost exclusively to the following works: First, studies after the antique by our pensioners at Rome.

Second, drawings of our French monuments of the Middle Ages, of the Renaissance and of the succeeding epochs. Some of these drawings are destined for the collection of our historical monuments of which they prepare or propose the restoration. Others are the gratuitous work of certain young artists who aspire to take a place in the ranks of the valiant phalanx of architects who, under the direction of Government, have for their life-mission the saving of our old French monuments from oblivion and ruin.

Third, certain *projets* which have won prizes in the public competitions, and certain others which have won for their authors the diploma of architect, which is now granted by the *Ecolé des Beaux-Arts* to those of its students who have regularly followed its courses and fulfilled its requirements.

Fourth, finally, executed works or works in course of construction and a series of drawings of classes too numerous to mention.

The work of our pensioners at Rome have been specially represented this year by an important restoration of the Temple of Ceres at Eleusis, by M. Blavette. Relying on certain well-conducted excavations and on some lines of Strabo, in default of any description by Pausanias, who seems not to have dared to penetrate the mysteries of the temple of the great goddess, M. Blavette has reconstructed this venerated sanctuary with an ingenuity which does not lack an air of probability. At any rate, with great success as a designer, who does full justice to the work of Ictinus.

By the side of M. Blavette, M. Paulin exhibited an interior view of the restoration of the Baths of Caracalla. This is only a water-color, but so knowing in composition is it and so marvellous in execution that this *envoi* has been one of the most appreciated exhibits.

Not undertaking to give you a detailed description of these exhibits, the enumeration of which, in default of drawings to aid the description, could only be dry, I will confine myself to indicating only the most remarkable of the works. Among the studies of the Middle Ages and the Renaissance I will name the church at Gallardon, by Mr. Petit Grand, a church commendable for its choir and apse. Then by the same architect a restoration of the building known as the Machicoulis at Puy-en-Velay, a remarkable specimen of our military architecture of the twelfth century. M. Calinaud has sent drawings of the church at Marmans. M. Degeorges shows two able perspective views of the church at Vézelay, a nave of the end of the eleventh century, and a narthex of the twelfth century.

All American artists ought to know, at least from photographs, the Hotel Bourgtheroulde at Rouen, that ravishing specimen of the architecture of the fifteenth and commencement of the sixteenth century. MM. Lafou and Marcel have presented restorations of a most irreproachable vitality and absolute perfection of drawing. The patient, and conscientious work of these young artists has been one

of the successes of the exhibition. Among the *projets* submitted must be particularly mentioned the Palais de Justice at Bucharest, by M. Albert Ballu, son of the lamented architect of the Hôtel de Ville, at Paris, and the Church of the Trinity. The *projet* of M. Albert Ballu, vast and well-arranged, is not less remarkable for the dignity and calm of its architecture. A magnificent *salle des pas perdus* gives accent to the exterior and forms the principal motive of the main façade. This fine building will be shortly erected in the capital of Wallachia. Let me also mention the barracks of the *sapeurs-pompiers* lately built at Paris, by M. Roussi, which contains all the latest improvements effected in this useful branch of the service; also a plan, very practical and complete, for the *marie* for the Eighth Arrondissement of Paris, by M. Achille Hermant. The design for an observatory, by M. Peigney, must not be overlooked; nor the lunatic asylum built by M. Ricquier at Dury-les-Amiens; nor a very luxurious hotel, built by M. Cuvillier, on the Avenue Wagram, Paris; nor the skilful sketches and drawings by MM. Courtois, Suffit and Hourlier; nor yet a crowd of drawings of various kinds which bear witness to the inventive energy and the executive ability of our architects.

But I must close, under penalty of exhausting your indulgent readers by an enumeration which they cannot control. I, therefore, at this point close this sketchy communication, happy if, in spite of my criticisms upon some features of American architecture, if, in spite of my very summary notes on the Paris architectural exhibition, I have been able to interest for a few moments my *confrères* on the other side of the Atlantic.

Paul Sedille.

THE DANGER ARISING FROM ELECTRIC-LIGHT WIRES AND THE UNDERGROUND SYSTEM.[1]

THERE is a certain resemblance between the heroism of the soldier who rushes to the front in battle and the brave lad who combats the fire fiend — the one is a hero of war, the other no less a hero of peace. Yet both enter upon their duties with their lives in their hands. The soldier is well aware of the dangers he is to encounter, and he goes into the combat with as perfect preparation as the science of modern warfare permits. The dangers that surround the fireman are often unsuspected until too late for prevention, too late for cure. A piece of faulty architecture may, when unsuspected, overwhelm him; illegally concealed chemicals may poison the air which he is forced to breathe; unexpected explosions may bury him in ruin from whence escape is impossible. There is also another element of danger of comparatively recent birth which is rapidly on the increase, especially in the larger cities, and which being new, is but little understood. It is needless to say that I refer to the wires which convey the heavier forms of electrical currents for purposes of power and illumination. The great adaptability of these currents for such purposes have rendered them extremely popular, and, to use a common remark, they seem to have come to stay. This being the case, it is best that we know how much of danger there is in these innocent-looking wires, and how best to prevent the mischief they are capable of. The dangers in the case are two-fold — those which threaten life and those which threaten property. With the latter form of danger the firemen are interested collectively as a body; with the former as individuals, and it is but reasonable that the individual interest is by far the most important and nearest to him. To get at the matter understandingly it will not be necessary to go deeply into scientific definition, but this much will perhaps aid in its comprehension. Electricity is a force like heat or light, and possesses properties of quantity or pressure like steam, and may also be impeded in its flow or progress by want of carrying capacity, those substances known as good conductors, such as iron, copper, etc., offering the least resistance, and dry wood, porcelain, glass, etc., the greatest resistance. The greater the resistance of a given substance the less electricity will flow through it. Another fact will aid us in this investigation. If two routes are open to this current from the starting-point at the battery or generator back to the source, the electrical current will divide between the two routes and the better conductor will carry the lion's share. Thus, if two wires of the same size, one of copper and the other of iron, form the two routes, the copper will carry nearly seven-eighths of the current, and the iron one-eighth only. Now, if I have made this relative conductivity plain to you, it must be evident that a wire carrying one of these heavy currents may be made perfectly safe under all ordinary circumstances if the wire remains intact and there is but one route over which it can travel in its journey from its source and back to the starting-point. This may be accomplished by the use of various forms of insulation and insulation, remember, only means extremely poor conductors to keep the wire from forming contact with other wires, portions of buildings, roofs, awnings, rods, etc., through contacts with which a portion of the current may be deviated to the earth.

An electric circuit may be perfectly safe with one such contact to the earth, while only one such contact exists. But if when one such contact already exists on the line, a second one occurs, the elements of mischief are present which may result in disaster to property or serious injury if not death to an individual; and we have seen that the introduction of these grounds is like tapping a water-pipe with smaller tubes of a greater or less capacity. To illustrate this, suppose one of these wires conveying a heavy current is clear of contact save at a single point where it lies against an iron rod running to the earth. This will make no material difference to the machine or the lights, and it may remain unknown for months, unless sought for, until a second ground contact is made, when a more or less violent demonstration will develop. If circumstances are favorable the result may be the setting of a mysterious fire when the wire lies in contact with a wet board. As a rule wet kindling is not in demand. Electricity rather prefers it, because water-soaked wood is a better conductor than dry. Then again the second ground may be made by an individual, who, intentionally or otherwise, placed himself in contact with the wire, thus tapping it and drawing off part of its current. Remember the rule that the amount of current which such a contact will carry off is proportioned to its capacity for carrying, exactly like a water-pipe.

Naturally you will ask how much current will an average man conduct from the wire under these circumstances? There are so many elements entering into the calculation that the question is quite difficult of solution. Of a dozen men, taken at random, no two consecutively tested would show the same capacity for conveying a current of electricity. And very likely no two of the entire twelve. The same individual, under different circumstances, shows widely different capacity, and from one point to another on the same individual the measurements are never the same. A person measured when the contact-points, say the hands, are covered with perspiration, will carry more current than after washing them in water, although they are left as wet as before. Why? Because salt water is better as a conductor than fresh, and perspiration is salty. The amount of current then that it is safe to risk, it is difficult to specify. We can tell what the limit is which flows from a given source, say a battery, and a current from a dynamo may be compared with it. Many of you have seen more or less fun produced by what little power there is in a single cell of a battery arranged to astonish the hangers-on around an engine-house. You may have experimented, perhaps, accidently with a battery of say 250 or 300 cells, and been perfectly satisfied with one attempt. There is a wide difference between the two forms, the incandescent and the arc-light currents, but it is just as well to give both a wide berth. Any current which maintains an electric light is good enough to let alone, and intimacy with such forces is just as well left to the electrical fraternity. The amount of force generated by an electric-light dynamo, compared with a battery current, is as the strength of a giant compared with that of a babe. To make this a little more definite, the current generated by an electric-light dynamo is anywhere from 1,600 to 3,000 times that from a single jar of a battery, and the amount which the unfortunate who attempts to be intimate with such a current will, according to circumstances explained above, receive will amount from a mere tickle, or an urgent invitation to dance, up to an order for a first-class funeral. There are electric-light men who claim to have taken the entire current from a sixty-light machine and lived. Somehow I could never get one of these modest fellows to come out and give an exhibition. They always do this sort of thing when they are alone. As far as I am concerned I am perfectly willing they should have the fame if they want it. How all these dangers may be reasonably well-guarded against is a pertinent question. Chicago, as you are well aware, took

[1] A paper by Prof. J. P. Barrett, Superintendent of Fire-Alarms for Chicago, read at the Fourteenth Annual Convention of the National Association of Fire Engineers at Providence, R. I., August 24.

steps in that direction over two years ago by the appointment of an inspector of electric lights, whose duty it is personally to examine and pass upon all plants within the city limits. He carefully considers the possibilities as well as the probabilities in the case, and orders such changes and dispositions as he deems necessary before the certificate is issued. In addition to this mechanical examination, electrical measurements are made by him to insure the absence or removal of grounds. In the majority of cases there is great danger of ground contacts where the wires of outside lamps are brought to the lamp. In order that this may be raised and lowered, a long loop of wire is allowed to swing in the wind, and may fold up in an awning or come in contact with an iron frame or other connection running to the ground. By an extremely simple and cheap contrivance this annoying and dangerous loop is now being done away with in Chicago, while the lamp is as readily raised and lowered as before. The surest and simplest remedy, the most perfect guard against danger to life and property from electric-light wires, as it seems to me, is inspection at the hands of some competent party, who should be clothed with authority to compel obedience to his just requirements. Again, the dangers from electric-light wires are materially lessened when these are placed beneath the ground, where contact with other wires, roofs and buildings is impossible, and where a loosened wire cannot drop across the street or sidewalk.

I must strongly urge upon all the great necessity as a precaution, a life-saving measure, of having some check put upon the unsafe methods of the electric-light people. The methods of accomplishing this are simple, and if an effort is made can be successfully carried out. The fire-departments and the insurance men are natural and friendly allies. If these but pull together for a general purpose they must succeed, and no stone should be left unturned until every electric-light plant in this country is subjected to proper inspection and control, and every wire, where possible, is put under ground.

I will conclude this paper with a few remarks as to why I consider underground wires the proper thing for cities generally, and for fire and police alarm service in particular, together with a short description of the system now existing in Chicago.

It is generally acknowledged that in a large, populous and wealthy city, where fire and police departments are considered necessary, that a simple, effective and reliable fire and police alarm system is indispensable. Such a system is in use in every large city in the country, and the electrical and mechanical parts of it have been so perfected by the work of earnest and scientific men that, as you know, a child can give an alarm that will at his choice summon either department to extinguish a conflagration or suppress a riot. But with the onward march of science, with the improvement in the equipment of the fire and police departments, with the improvement in the mechanism of electrical instruments, and the mastery that man has gained over electricity, the method of stringing wires for electrical use has not kept pace; in other words, the line-man has not kept up with the procession. In any large city in the land you can see huge poles towering aloft, carrying tons of iron wire; you can see these wires crossing and recrossing the streets, until it would seem as though you could not fire a bullet in the air without striking one. You can see them fastened to the same old cross-arms, uprights, brackets and insulators that we saw years ago — a menace to life and limb of the passers-by, a hindrance to the fire-department, and a general nuisance to everybody.

It has long been my conviction that the proper place for electric-wires in a large city is under the surface of the earth. Especially is this true of fire and police wires. In a system from which so much is expected, where a single broken wire may cause a delay in giving an alarm, involving a loss of thousands of dollars, it seems to me that we should have the wires in a place where wind, sleet and sulphurous gases cannot harm them. To be perfect, a fire-alarm system must be certain. It should be an absolute certainty that, when the hook in a fire-alarm box is pulled down, an alarm will be given to which the department will respond. We cannot have this certainty in our present system of aerial wires strung in the neighborhood of hundreds of other wires, subject to the destructive action of smoke and storm, liable to accident from countless causes; there is no reasonable certainty that, at the time a box is pulled, the line to which it is connected is not open or crossed in such a manner as to render it for the time being useless With a wire of suitable conductivity, well insulated and protected from mechanical injury, placed under ground, we will have this certainty, which the air line cannot give.

That is the way I feel about underground wires, and I am backing up the faith that is in me by planting those of the Chicago fire and police alarm telegraph as fast as I can get money to do it with. With me it is not a question for hair-splitting argument; it is a question of money, of first cost. Outside of that, everything is in favor of underground and against aerial wires, and that seems to be the general sentiment. All over the country we see or hear of preparation to get wires down. Although some of the telegraph companies are moving in that direction very reluctantly, still they are moving, and we may hope to see, at no distant day, all or nearly all of the poles and wires removed from the street and air, and when I tell you that up to July first, of this year, the city of Chicago and the various companies interested have taken down 608 poles and removed 917 miles of aerial wires, you will understand we have made a mighty stride in favor of the underground system.

In Chicago the agitation of underground wires commenced about the year 1875 or 1876, and in the year 1877 we laid our first underground wires. The work was performed under my supervision. We put down 840 feet of iron pipe, treated inside and out with a liberal dose of Stockholm tar, and through this we pulled two kerite wires. These proving satisfactory, the agitation was kept up, and a law was passed in 1881, to take effect in 1883, compelling all corporations and individuals owning or controlling wires within the corporate limits of the city to place them underground. In order to accomplish the requirements of the law, it was necessary to do away with the concessions which had been made by the authorities to the companies. It has been a work of time, perseverance and ingenuity, but it is now well under way, and we have underground systems of several kinds: iron pipes, wooden boxes filled, some with asphaltum, others with cement, etc.

Perhaps the most complete is that of the Sectional Underground Company, which is the Dorsett system, an asphalt concrete pipe made into one or more conduits or ducts, with man-holes and hand-holes through which cables are drawn in or removed. Outside of the city wires there is now controlled by the Sectional Underground Company a system consisting of about seventeen miles of conduit with 150 miles of wire, which includes all the electric-light wires; Western Union Telegraph Co., ten miles of conduit, with 200 miles of wire; Chicago Telephone Company, three miles of conduit, with 700 miles of wire; Bankers' and Merchants' Telegraph Campany, fifteen miles of conduit, with 400 miles of wire; Postal Telegraph Company, four and one-half miles of conduit, with 100 miles of wire; and the Baltimore & Ohio Telegraph Company, one-half mile of conduit, with fifty miles of wire.

Our municipal system, exclusive of the city electric-light wires, consists of sixty-three and one-half miles of single wires laid through 7931 feet of conduit built and owned by the city; twenty miles of single wires laid through four miles of conduit owned by the Sectional Company; ten miles of single wires placed under sidewalks in the central parts of the city; 1955 feet of wire in 840 feet of iron pipe, and about a mile and a half of cables under the river at Archer Avenue, Chicago Avenue, Division Street, Claybourne Place, and through the Washington and La Salle Street tunnels. The single wires are No. 13, copper-wire, B. & S. gauge 7-32, kerite insulation, wrapped with tape. The cables through the Washington and La Salle Street tunnels are of kerite, and the others gutta-percha insulation.

The conduit owned by the city is a nine-inch concrete pipe leading from the City-Hall to La Salle Street, and branching from there to the North Side, ending at Huron Street, to the south ending at Harrison Street, and to the West Side, ending at Clinton Street, with man-holes forty-four inches in diameter and five feet deep, for the purpose of testing, drawing in and out, etc. In the Huron Street branch we have twenty, in the Harrison Street twenty, and in the Clinton Street branch forty-two wires leading to lightning-arresters at each end, and from these points the air-lines diverge, covering the northern, southern and western districts of the city. In the man-holes we have testing boxes made air-tight with screw-head and rubber gasket. If we have trouble on one of these lines we can locate it between two man-holes, draw the faulty wire out, and put a good one in. The wires in the conduit were put in service in August, 1884, and have not given us any trouble since.

The wires placed in the Sectional Company's conduit and under sidewalks are wholly underground lines. They cover an area of nearly a square mile, and to them are connected all the municipal telegraph and telephone apparatus in that part of the city bounded by the river on the north and west, Van Buren Street on the south, and Lake Michigan on the east; in all forty-two street fire-alarm boxes, twenty-three police-alarm stations, seventy-nine private police and fire-alarm boxes, three fire-engine and hook-and-ladder companies, one marshal's residence, police patrol and fire-insurance patrol wagons, eight newspaper offices and the rooms of the Press Club. In this district is concentrated the greater portion of the wholesale, mercantile and banking interests of the city, and consequently here we have signal stations so located that the fire and police departments can be summoned from every hand.

With these stations located in so many different places, how to reach them was probably as difficult a problem as the underground question can present. By using a duct in the Sectional Company's conduit, and utilizing the space underneath the sidewalks, between the area wall and the building line, we solved the problem in a manner highly satisfactory, at least to us, and by so doing were enabled to remove from the streets about ten miles of poles, and from the air twenty-five miles of wire, and have our wires where wind or sleet storms cannot harm them. The sidewalks are mostly of stone, and the space beneath them has been excavated and put to a variety of uses, such as barber-shops, boiler-rooms, Chinese laundries, tailor-shops, restaurants, saloons, coal-bins, etc. Although acting on the presumption that the city has a legal right to this space, the fact that the entrance to it lay through the store or office of the occupant, made it necessary to obtain his consent before placing our wires therein. When we explained that the ultimate results of so doing would be the removal of the unsightly masts that cumbered the streets, and the labyrinth of wires from the air, this consent was readily obtained.

The buildings are separated by partition walls, varying in thickness from six to thirty-six inches, and where used as coal-bins, etc., each building is divided by several partitions. These walls and partitions average about twenty to the block, and vary in kind from the

one-inch board to the three-foot stone wall. We cut through the walls, and, where the nature of the place required it, put in inch and inch-and-a-quarter iron pipe, using a short piece of larger diameter at the joints, instead of the regular coupling; this piece can be slipped back and forth, making it easy to get at the wires when necessary for the purpose of testing, etc. Where it was clear and dry, and mechanical protection unnecessary, we placed the insulated wires, without covering, well up out of the way, where they would not be likely to be interfered with. We crossed fourteen alleys, varying in width from fourteen to thirty-three feet, and mostly paved with granite blocks. As it was desirable to get through without digging up the paving, we drove pipes across, using for the purpose extra-thick inch-and-a-quarter iron pipe, with a steel point screwed in one end, and a drive-head on the other. When through, the head and point were taken out and the wire drawn in. We fastened our fire-alarm boxes to the lamp-posts, bringing the wires up through the posts and out to the box through a short piece of bent pipe. Where the fire and police boxes were located on the same corner, we set the fire-alarm box in the police-box facing out. The whole thing was the work of considerable difficulty, and required patience and perseverance, but we finished it in good shape, and I am happy to say that in that portion of Chicago known as the South Side, north of Van Buren Street, the city does not own an aerial line.

In conclusion I would state, as an instance of the desirability of underground wires, that those placed in the iron pipe in 1877 are giving as good service to-day as the day they were planted. We have never had occasion to touch them since; never had a ground cross or break on them, and for aught I can see they will continue to give the same good service when you and I have been called to our fathers, and have gone where I hope there are no fires—where fire-alarms and fire-department service will not be needed.

SEWAGE DISPOSAL IN BERLIN.[1]

From the House of Pansa, Pompeii.

The system of sewerage in Berlin begun in 1870, has been in full operation for nine years, and now includes seven of the twelve districts into which the city has been divided for sewerage purposes.

The plan contemplates in each district a pumping station, where all the sewage is pumped to the irrigation-fields, some fifteen miles distant. Seven pumping-stations are established. The irrigation-fields are four in number, located to the north, north-west, south and south-east of the city. The four fields contain 14,666 acres of land.

Of the stations which I visited, it will be more interesting to describe the one which operates the drainage from the middle section of Berlin, which includes the Unter den Linden with its palaces, and a densely-populated district as well. One might suppose that its location would be in some out-of-the-way place, but we found it in a desirable portion of the city, not specially removed from other buildings, and only three minutes' walk from one of the finest railway stations in Europe. The buildings and grounds had a neat and orderly appearance.

In the yard I was first shown the large cistern into which is poured, and through which is strained the sewage of the whole district, including the flush and rain waters. The district has a population of 130,000, and the quantity of sewage pumped here is about 16,000 cubic metres daily. On Saturdays it is increased to 20,000 or 30,000.

It requires but an hour-and-a-half for all excrementa and other sewage to get from the place of deposit to this cistern, and so great is the quantity of water that by the time it is reached the excrementa are in thorough solution. The water dilutes and renders them inoffensive, and they are pumped away before putrefaction begins. It has been shown that in 500 cubic metres of the fluid there is but one cubic metre of solid matter; and in fact this fluidity of the sewage and its very rapid removal appear to be the two features which make this system successful.

The cistern has a capacity of 5,000 cubic metres. Its location is but a few yards distant from a busy street, and not more than twenty steps removed from the front entrance of the local manager's residence. It is covered with boards an inch apart, and upon stepping upon the platform we failed to notice any odor. No sickness has been caused by it either in the manager's residence or among the laborers. Occasionally it is necessary to flush it with water.

An attendant raised a few of the planks to give us a view of the contents. It appeared about half-fall of simply a muddy-looking fluid, a bucketful of which was hauled up and emptied back to show that it was liquid and without stench. The canal was visible through which the fluid was rapidly discharging into the cistern. It is elliptical, its longest and horizontal diameter measuring 3.40 metres, and its shortest or vertical diameter, 2.90. The fluid is not pumped directly from this cistern, but has to pass into a suction pit some thirty or forty feet nearer to the engines. The outflow channel has the same capacity as the one just mentioned, but its mouth is on a higher level and differs, too, in shape, being imperfectly elliptical, with the longest diameter vertical instead of horizontal.

Between the two openings, dividing the cistern into two equal parts, is an iron grating or strainer, the bars of which are perpendicular and two centimetres apart, and serve to catch paper, rags, etc., which are scraped out every day or two and burned under the boilers. The fluid passes into the suction pit just mentioned, where there are six cylinders operated by six engines. The pit was opened for our inspection, and though the fluid was in agitation there was no odor. Connected with the pit is an overflow for use when the rainfall is so great that the engines are unable to pump off as rapidly as the fluid collects.

We are now prepared to observe the other half of the system, viz.: its transmittal of the sewage through the pipes to the fields.

Taking the cars at the Anhalter Bahnhoff, a twenty minutes' ride brought us to the village of Lichtenfelde, a country place of ordinary appearance, as level as an Illinois prairie.

As we approached the fields on foot our noses were on the *qui vive* to detect the first polluted zephyr from the suspicious territory, but there was no zephyr of that kind. Presently we were on the borders of the fields, and made our way to a small collection of houses, inhabited by laborers and their families, to the number of about one hundred people. Finding the office, our permit insured us prompt and polite attention.

On going into the fields after noting the absence of odor, and the day was mild, our next surprise was the entire absence of machinery. The pumping force of the engines in Berlin is sufficient to throw the fluid to two central distributing points through channels measuring respectively one metre and seventy-five centimetres in diameter. From these two central points distributing pipes radiate in every direction for a certain distance, connecting with the open courses or ditches which extend through the fields. At the point of junction of the pipes with the ditches, valves are provided for regulating the flow.

There is no reservoir, the sewage being distributed as fast as it is received. But it sometimes happens that valves of a number of the distribution pipes are closed and at the same time an unusual amount of pumping is necessary at the station in Berlin, thus causing a sudden excess of sewage. To relieve this, at each of the two central points just named there is erected a stand-pipe provided at the top with an overflow which discharges into neighboring shallow basins, sixteen in number. These stand-pipes have the appearance of small towers, their tops being twenty-one metres above the city. The plain around Berlin is thirty or forty feet above the city, and these pipes are about thirty feet above the level of the plain.

A watchman is on duty at each tower to give notice of an overflow by means of a bugle, calling the workmen to open the valves. An automatic arrangement gives the same notice by a flag, or at night, a lantern.

The fields over which we were looking contain 3,333 acres. They receive the sewage from sections 1, 2 and 3 of the 12 sections into which Berlin is divided. Five thousand cubic metres of liquid are distributed into them every twenty-four hours, of which twenty-five per cent remains as deposit and seventy-five per cent flows off as water. We were informed that for every 500 persons there is required about two-and-two-thirds acres of land, and that the area of irrigation land required is about one-and-a-half times the surface of the city drained. The fields are very level, and are divided by avenues lined by small trees and by ditches and furrows. The sections are of two sizes, the larger called meadows for raising grass, and the smaller called beds, for the growth of vegetables.

We inspected a particular meadow containing about four acres, and questioned a laborer at work on one of its ditches. It had been flooded four days before, and was to be flooded again on the following day. Its soil appeared simply dark and moist: a ditch surrounded it, two feet in width and one-and-a-half feet deep, through which the sewage fluid was slowly running. The current was made stronger, indeed quite forcible, by turning a valve at one corner of the meadow where an open ditch connects with the distributing pipe. To flood the meadow the current is put on at full force, and the surrounding ditch opened at various points on the meadow side. This

[1] A paper by Walter Wyman, M. D., Surgeon, United States Marine Hospital Service, in the *Herald of Health*.

meadow gave five cuttings of grass last summer. We saw others which had just been flooded, having the appearance of shallow ponds. About three days is required for the disappearance of the water.

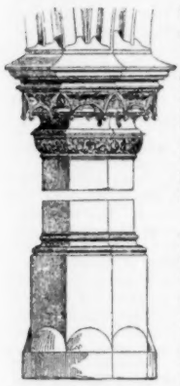
Besides grass, rye, oats, wheat, corn and hemp are raised; and in the beds, sugar-beets, carrots, turnips, cabbage and chicory. Cows are pastured in the fields and are healthy. A laborer who had been employed here for five years, asserted that there was no sickness among the workmen, except rheumatism, caused by working on the moist ground, and that sometimes in the summer strangers complain of the odor, but the workmen never. The odor is experienced in the morning when the stop-valves are opened, and gas which has accumulated during the night escapes. This passes off in a few moments. There is some stench also when the ditches are cleaned, as they must be occasionally.

The remaining point to be explained is the method by which these beds and meadows are prevented from becoming marsh-like and soggy, in other words, the drainage. They are all underlaid by porous drain tiles, placed one or more metres below the surface. Where the soil is sandy the tiles are about seven metres apart; where it partakes more of the nature of clay they are but three metres apart. The water collects in the tiles, and runs into receiving ducts which empty into a main ditch. This ditch discharges into a small stream, that flows into the River Havel. At Potsdam, the summer seat of royalty, the emperor's palace, "Babelsberg," is located directly on this river, and the water discharging into it is clear, inoffensive and free from deleterious matter.

Germans returning from America after an absence of ten or twenty years, express surprise at the wholesome change in the sanitary condition of the city; and it is claimed that the health of the sections in which it has supplanted the old cesspool system has been greatly improved.

It is considered significant that the River Spree, flowing through the city, contains many more fish than it ever did before. Certainly Berlin is a clean city. Rapidity of disposal and without offence are two characteristics of its sewerage system, and water, earth and air, all in the greatest abundance, seem to solve for it the great sewage question. In estimating the positive value of the system, one must not forget the conditions both adverse and favorable, which led to its adoption in Berlin. In the first place Berlin has no large river to receive its sewage, nor is it near the ocean. It is built in the level valley of the River Spree, which flows through a large plain. The city is on a lower level than the plain, but the soil of the latter is sandy, making the best kind of ground for the filtration of sewage fluid.

AUTOMATIC SPRINKLERS, RATES AND CONTINGENCIES.



THE *American Exchange and Review* says: There is now an experience of about nine years in the sprinkler fixtures as defensive against fire in New England mills. The New England Fire Insurance Exchange has a standing Committee on Factory Improvement and Protection, and at the last meeting of the Exchange this committee made a report especially recommending one sprinkler — a dry-pipe system:

"May 1, 1886, there are 929 establishments protected by the Grinnell Sensitive Automatic Sprinklers, with an insurable value of $200,000,000. Losses on the property protected by this sprinkler from May 1, 1882, the time when the Providence Steam and Gas Pipe Company commenced to introduce it in the place of the Parmelee sprinkler, to May 1, 1886, amounted to $12,497.92. Number of fires where no claim was made, 99; where claim was made, 20. Total number of fires, 119. Average loss to one fire, $105.02, and an average of one fire to every eight establishments. The report of the largest insurance company doing business on this class of property reports fires on the property protected by automatic sprinklers of all kinds from 1877 to 1886: Number of fires, 224; average loss per fire, $382.36."

Our contemporary adds: the committee does not appear yet to regard such rate of fire-loss as sufficiently established to warrant the reduction of insurance to, say $2,000 or $3,000 per establishment. A special committee is, however, recommended, to be called Factory Protection and Automatic-Sprinkler Committee, which is to have consideration of all questions connected with the subject. The sprinkler has not become an absolute reducer of jeopardy, being itself subject to contingencies. The committee put the following as absolute conditions for effective operation:

"1. A sprinkler should cover every part of the building, including stairways, elevators, closets and all concealed spaces.

"2. A supply of water, valves all open, and pressure on the pipes, whatever it may be, free and in working order."

Further, it is said:

"The whole sprinkler system may be the best, the water-supply ample, and yet if the main valve is closed the whole apparatus is worse than useless. With all the care used, the number of valves found closed is surprising. Sprinkler people have been working to devise some simple arrangement by which the closing of the valve would be detected and the alarm given, but as yet without the desired effect. A water-gauge above the valve and set-cocks may be of some value, but are not to be depended upon. At present the greatest care should be observed, and the main valve should be strapped open by a riveted leather strap, the strap passing around the pipe and a spoke of the hand-wheel used for opening the valve, and under no circumstance should a left-hand valve be allowed in a sprinkler system. . . . In order to reduce the chances for accident to a minimum two sources of water-supply afford the best protection. The desired pressure may be constantly maintained by a tank located above the highest point to be protected by sprinklers, by reservoir pressure through main streets, by steam-pumps having automatic-pressure regulations, and by air-pressure tanks. The size and location of the elevated tank will depend upon various conditions, including that of auxiliary supplies, but there should not be less than 3,000, and for a system of fair size 5,000 gallons and the bottom of the tank should not be less than ten feet above the highest point to be protected. Steam-pumps should be duplex and of from 250 to 500 gallons capacity; should be connected automatically and with a drip, so that the pumps may be always in working order. The size of the pump depends on the size of the property to be protected. An air-pressure tank consists of an iron tank of desired capacity about two-thirds full of water, the remaining space filled with compressed air under pressure of about eighty pounds. This may be an important apparatus for supplying pressure on the top of high buildings in cities. A force-pump may also be used as a secondary source of supply connected with the system of sprinkler-pipes; proper check-valves to be placed in the pipes. Protection by hydrants should not be overlooked, but they should be independent from the system of sprinkler-pipes."

At the present stage sprinkler protection appears to be a change in the fire contingency, attended with incidental reduction of loss. Great confidence is felt in the eventual successful establishment of the method, and thereby the mills so guarded against fire will either be kept in the specially hazardous class by small lines at specially hazardous rates, or reduced to the non-hazardous plane of brick dwelling-houses with large lines at dwelling-house rates. At the present stage, with little established that is definite, the Exchange committee recognizes that "the conditions vary with every risk," and that each case should be considered by itself. If, however, we are to understand the first paragraph quoted as meaning what it says, the variation in risk is reduced to an inconsiderable trifle, the fire cost being almost entirely eliminated — that is, reduced to less than two mills per annum per $100 of insurable value.

COMMUNICATIONS

THE MOMENT OF INERTIA.

TORONTO, CAN., August 12, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— In Article II, "Safe Building," published in your paper of April 3, is given a rule for finding the moment of inertia of the cross-section of any body, which, applied to Figure 1, Table I, gives, according to my working, $\frac{d^4}{16}$ instead $\frac{d^4}{12}$. Would you kindly oblige me by telling me how the 12 is obtained?

Yours truly, A STUDENT.

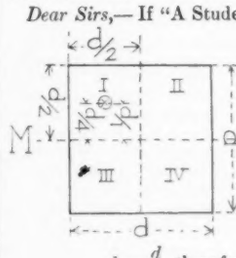
NEW YORK, August 25, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— If "A Student" had sent on his way of working out the problem, his error could probably be easily pointed out to him. To prove the rule correct, take the figure of a square and divide it into four simple squares, I, II, III and IV, and apply the rule, viz:

$$i=(d_{\mathrm{I}}^2.a_{\mathrm{I}}+i_{\mathrm{I}})+(d_{\mathrm{II}}^2.a_{\mathrm{II}}+i_{\mathrm{II}})+(d_{\mathrm{III}}^2.a_{\mathrm{III}}+i_{\mathrm{III}})+(d_{\mathrm{IV}}^2.a_{\mathrm{IV}}+i_{\mathrm{IV}})$$

Now, considering part I, we shall have:



$$d_{\mathrm{I}}=\frac{d}{4} \text{ therefore}$$

$$d_{\mathrm{I}}^2=\frac{d^2}{16} \text{ further,}$$

$$a_{\mathrm{I}}=\frac{d}{2}\cdot\frac{d}{2}=\frac{d^2}{4} \text{ and}$$

$$i_{\mathrm{I}}=\frac{\left(\frac{d}{2}\right)^4}{12}=\frac{d^4}{12.16}$$

Now, it is evident that as parts I, II, III and IV are all situated the same, relatively to the main neutral axis M..... N, that

$a_{\mathrm{I}}=a_{\mathrm{II}}=a_{\mathrm{III}}=a_{\mathrm{IV}}$; also,

$d_{\mathrm{I}} = d_{\mathrm{II}} = d_{\mathrm{III}} = d_{\mathrm{IV}}$, and
$i_{\mathrm{I}} = i_{\mathrm{II}} = i_{\mathrm{III}} = i_{\mathrm{IV}}$

We shall have, therefore, for the moment of inertia (i) of the whole section,

$$i = 4.(d_{\mathrm{I}}^2.a_{\mathrm{I}} + i_{\mathrm{I}})$$

Inserting the values for d_{I}, a, and i_{I} we have:

$$i = 4.\left(\frac{d^2}{16}\frac{d^2}{4} + \frac{d^4}{12.16}\right) = \frac{4.d^4}{16}.\left(\frac{1}{4} + \frac{1}{12}\right) = \frac{d^4}{4}\frac{4}{12} = \frac{d^4}{12}$$

"A Student's" letter calls my attention to an oversight in the article in question. The third line from the bottom of the first column should read: "Distance of the centre of gravity of each part from *the neutral axis through* the centre of," etc. Still, even this omission does not account for "A Student's" error.

Yours very truly, Louis DeCoppet Berg.

RUSTY DRAWING-INSTRUMENTS.

Bridgeport, Conn., September 1, 1886.

To the Editors of the American Architect:—

Dear Sirs,—Will you please tell me the best way of removing rust from draughting instruments?

Very respectfully, A. Paddock.

[Remove it by gentle rubbing with rotten-stone and oil, and then apply a mercurial compound which gunsmiths use to protect the fine work of guns and pistols.—Eds. American Architect.]

THE LEADING AMERICAN ARCHITECT.

Philadelphia, Pa., August 13, 1886.

To the Editors of the American Architect:—

Dear Sirs,—Will you kindly (if agreeable) inform us as to who, in your opinion, is the leading architect in the United States? An early reply will greatly oblige,

Yours sincerely, R. L. Polk & Co.,
Pub. A. & B. Directory, U. S.

[We prefer to let some one else answer this conundrum. Perhaps the exalted individual has not too much modesty to declare himself.—Eds. American Architect.]

THE NORTH EASTON TOWN-HALL.

St. Louis, Mo., 1886.

To the Editors of the American Architect:—

Dear Sirs,—Please be so kind as to give me the names and *colors* of the stone used on the Town-Hall, North Easton, H. H. Richardson, Architect. Yours respectfully, F. W. Folk.

[The greater part of the stonework in the lower story and basement is a buff-colored granite, perhaps from Dedham, Mass. The arches, quoins, window-dressings and so on, are Long Meadow sandstone, of a color suggested by that in the gelatine plate in this issue. The bricks are red and the roof covering red-tile.—Eds. American Architect.]

NOTES & CLIPPINGS

The Hours of Labor in Paris.—M. Longuet, a prominent writer on the *Justice* and a member of the Paris Municipal Council, brought forward at the last sitting of that assembly a motion to reduce the daily hours of labor in all municipal works and offices to eight. One day in the week would besides be set apart for rest. The Director of Public Works, M. Alphand, opposed the motion on the ground of expense. It was finally negatived by forty-two votes against twenty-five, and an amendment fixing the maximum day's work at nine hours, with the proviso of a day of rest, was adopted by thirty-three votes against thirty-two.—*London Daily News.*

Age of German Universities.—A comparison of the ages of the several German-speaking universities is of interest just now in connection with the Heidelberg commemoration. The oldest is Prague, founded in 1348; next comes Vienna, founded in 1365; Heidelberg follows, being the senior of the universities in the German Empire, founded in 1386; then Leipsic, in 1409; Frieburg, (Baden), in 1454; Griefswald, in 1456; Bâle, in 1460; Munich, in 1472; Tübingen, in 1477; Marburg, in 1527; Königsberg, in 1544: Iena, in 1558; Würzburg, in 1582; Giessen, in 1607; Kiel, in 1665; Halle, in 1694; Breslau, in 1702; Göttingen, in 1737; Erlangen, in 1743; Berlin, in 1810; Bonn, in 1818; Zürich, in 1838; Berne, in 1834; Strasburg, reëstablished in 1872, originally founded in 1567.—*London Times.*

A Western Fence Story.—A Nevada newspaper has outdone the Georgia liar. It alleges that some months ago W. J. Marsh, of Fort Churchill, built a fence around one of his meadows along the bank of the river, and for posts used young cottonwood and willow trees. A gate was made in the fence and an extra-heavy post was put in the ground for the gate to swing on. It was noticed that a number of the green posts were sending out branches, but no attention was paid to this fact. After cutting the first crop of alfalfa in this field some cattle were turned into the enclosure through another gate, away from the river. They were soon found outside of the fence and a man was sent to find out where the fence was broken. He had found the fence all right, but upon coming to the lower gate found it raised about five feet in the air—high enough for the cattle to go under. The post to which the gate was hinged had grown that much and carried the gate with it.

Cæsar Borgia's Tomb.—A singular quest has resulted in a singular find. For some time past M. Yriarte has been seeking for the tomb of Cæsar Borgia. There were traditions to assist, but they seemed, on the whole, not very trustworthy. It was known that Borgia had been buried somewhere in Navarre. His last years had been spent as a volunteer in the army of his brother-in-law, who was King of the country. But beyond the fact that he served in the army and was killed by a musket shot at the siege of the small town of Viana, near the Ebro, nothing definite was known. It seems strange that a Prince who found a chronicler in Machiavelli and who was once the terror of all Central Italy, from the Adriatic to the Mediterranean, should have passed away with no definite note of where his ashes were interred. Had he been an ordinary exile the circumstance might have been explained. M. Yriarte has, however, had strange success. Naturally the place where investigations should commence was the town where Borgia lost his life. But the search was fruitless. Then the whole of Navarre was made the subject of inquiry. The records of churches and the archives of towns were investigated with results that only misled. At last M. Yriarte came on a clue. In the presence of the Judge of the district the street in front of the church was ripped up, and there the coffin and the body were found. It is supposed that in some early restoration of the church a by-gone Bishop of the diocese, outraged at finding so bad a man buried in consecrated ground, had ordered the coffin to be removed; but it seems strange that no tradition of the circumstance should have lingered at Viana.—*Pall Mall Gazette.*

TRADE SURVEYS

The phenomenal growth of the iron trade is shown in the recently published statistics of the American Iron and Steel Association. These figures are instructive and interesting for the bearing they have on the general construction interests of the country. Among other showings are these: Nineteen large blast-furnaces are being built, thirteen extensive rolling-mills for iron and steel, two nail factories, seven Bessemer steel-works of great capacity, two Clapp-Griffith steel-works, seven open-hearth steel-works, besides numberless smaller plants for furthering the process of iron and steel manipulation. The report shows there are fifty-seven iron rod and wire mills, twenty-seven iron nail-works, eighty-five car-works, seventy-six car-axle works, one hundred and eight car-wheel works, twenty-five locomotive works, twenty-five wrought-iron-pipe works, and thirty-one cast-iron-pipe works. There are sixty-eight rolling-mills using natural gas, and sixteen preparing for its use. The crude iron productive capacity is nearly 10,000,000 tons per annum, the iron and steel rolling-mill capacity 7,613,000 tons. There are four hundred and twenty-three rolling-mills and five hundred and seventy-eight blast furnaces. No other industry watches its progress as does the iron industry. It is therefore referred to as a trade barometer. The industries are in good condition. The fifty-seven iron-rod mills and the twenty-seven wire-nail mills, and eighty-six car-works, and seventy-six car-axle works, and twenty-five locomotive-works, and all other enumerated industrial establishments are quite full of orders. In numerous cases orders will keep works running until the holidays. The country is entering on that condition which usually precedes an advance in prices, but exceptional causes are likely to prevent any material advance, the reasons being the determination of the organized industries to not overcrowd the channels of trade, and the extraordinary demand which will engage nearly all the capacity. The danger of overdoing is present, of course. Enterprise was unduly encouraged a few years ago by the low price of labor. Its high price and the general advance in raw material will act as a break and thus help to preserve an equilibrium between demand and supply. There is, therefore, good reason for the existing confidence in trade and manufacturing circles. The week's record in railroad building is encouraging. Foreign manufacturers of iron, steel, hardware, machinery, and dry goods are doing a larger business this year, and the increased importations seem to find ready market, one very satisfactory condition of things is to be found in the general increasing demand for building material in which lumber, as usual, takes the lead. The improvement has started in the primary markets. Manufacturers themselves have inaugurated a new rule, viz., to demand and exact reasonable prices. Grain movements are fifty per cent greater this season than last. The European wheat crop is a partial failure and a heavy export-trade is counted on. All the important lines are taxed to their utmost, and car and car-wheel works have been filled up with orders. Repairing requirements on railroads and in manufacturing establishments are a very important factor. The managers of our great interests are anxious to pursue a policy which will prolong the present period of activity. Industrial development has been by leaps. It can be and will be gradual and steady as the best interests of society come to be understood.

The summary of August permits shows a very healthy condition, especially in the Middle and Western States; no drawbacks are apparent. New building and engineering enterprises are springing up. The demand for small houses is still in excess of the supply; here and there agents complain of a declining tendency in rents of older houses in large cities, but this evil will be of short duration. Rents in many places have been too high, and the trouble is only correcting itself: the outcome of all this unusual building activity will be a decline in rents; in fact, this tendency has been observable for two years or more, but it has not detered investors. The popular building and loan association system is growing quietly in the West, and is productive of good results. Architects complain, with good reason, of the utilizing of their building-plans in other enterprises than originally intended. Builders frequently dispense with the services of architects, but frequently to the disadvantage of the investor. In the Western cities, where organization is general, there is but little complaint of this kind; the services of architects are in good request there, while in some Eastern cities talent is less actively engaged. Chicago builders have had a remarkably good year. The supply of brick is twenty per cent greater this year than last, and prices are from fifty to seventy-five cents above last year's prices. In St. Louis building activity is fair, but less urgent. Large warehouses have been built, and bank and church work has been good. In Cincinnati there is a reviving activity, and architects look for more business next winter than last. In Pittsburgh work is improving. In Cleveland large contracts have just been placed for building material and supplies. In Richmond, Va., some important building enterprises are projected. Reports from several Southern inland cities indicate fair building activity. Near home, architects are quite confident, and builders have more than the usual amount of work in hand. Building-labor is in active demand. Wages are steady. Strikes are occurring here and there, but no trouble is anticipated on a large scale.